

## ARIKAMEDU :

### AN INDO-ROMAN TRADING-STATION ON THE EAST COAST OF INDIA

By R. E. M. WHEELER, with contributions by A. GHOSH and KRISHNA DEVA

*Arikamedu, the special importance of which in South Indian archaeology has been stressed on p. 1 of this Number, represents the site of a considerable buried town on the Coromandel coast. Two sectors (Northern and Southern) excavated in 1945 and partially uncovered by previous excavators were found to have been occupied in the first and second centuries A.D., and to have been extensively despoiled for bricks in the middle ages and later. The Northern Sector contained the remains of a substantial structure upwards of 150 feet long, built about A.D. 50 on the former foreshore above vaguer vestiges of earlier occupation extending perhaps over half a century. The building, from its site and character identified as a warehouse, must from the outset have been liable to flooding, and was abandoned at an early date. The Southern Sector, on the other hand, comprised a site which stood some 10 feet above flood-level, and was occupied for a hundred years or more from the middle of the first century A.D. onwards. Its principal structures consisted of two walled courtyards associated with carefully built tanks supplied and drained by a series of brick culverts. It is conjectured that these tanks and courtyards were used in the preparation of the muslin cloth which has from ancient times been a notable product of this part of India and is recorded by classical writers as an Indian export. Amongst the other industries of the town was that of bead-making. Gold, semi-precious stones and glass were used for this purpose, and two gems, carved with intaglio designs by Graeco-Roman gem-cutters and in one instance untrimmed, suggest the presence of Western craftsmen on the site. Numerous sherds both of a red-glazed pottery known to have been made in Italy in the first centuries B.C.-A.D. and of the two-handled jars or amphorae characteristic of the Mediterranean wine-trade of the period, together with Roman lamps and glassware, combine to indicate that Arikamedu was one of the regular 'Yavana' or Western trading-stations of which both Graeco-Roman and ancient Tamil writers speak. As the first of these stations actually identified by excavation in India, Arikamedu will hold henceforth a distinguished position in the history of the economic relations of India with the outside world. And the discovery has other features of interest. A Roman market on the Coromandel coast implies a knowledge of the south-western monsoon, which the historian may now suppose to have been in regular use at an earlier date than was previously conjectured. The epigraphist and the palaeographer will find amongst the graffiti some of the earliest dated fragments of the Tamil language. To the geographer, the very considerable rise in water-level shown to have occurred hereabouts within the last two thousand years, though due at least in part to local causes, is perhaps of incidental note. But the most significant result of these excavations is that, by establishing at last the precise chronological position of an extensive South Indian culture, the archaeologist has provided a new starting-point for the study of the pre-medieval civilizations of the Indian peninsula.*



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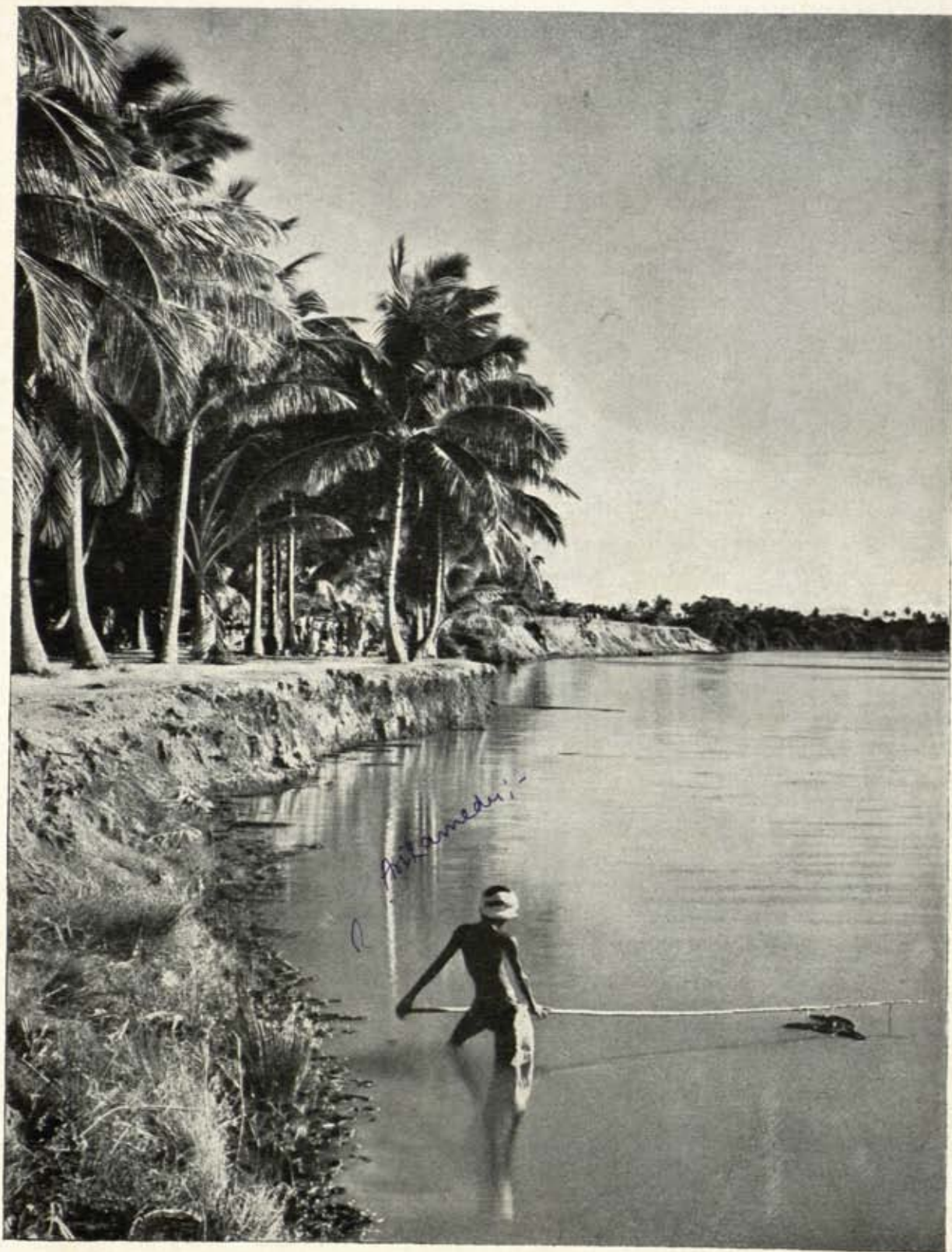
## 1. THE SITE AND ITS HISTORICAL BACKGROUND

THE classical geographers and the Tamil literature of the 'Śaṅgam' age have familiarized historians with the outlines and some of the details of Indian trade with the West in and after the first century A.D. At its prime, the trade was extensive. It included as Indian exports pepper, pearls, gem-stones, muslin, tortoise-shell, ivory and silk; and as imports from the West coral, lead, copper, tin, glass, vases, lamps, wine and, at first, coined money.<sup>1</sup>

By the latter part of the first century A.D. the literary evidence makes it clear that this trade was organized on lines not unlike those of the European 'factories' established in India from the sixteenth century onwards. The *Periplus of the Erythraean Sea* (c. A.D.

<sup>1</sup> The best reviews of Indian trade with the Roman Empire are by M. P. Charlesworth, *Trade-routes and Commerce of the Roman Empire* (Cambridge, 1926), and E. H. Warmington, *The Commerce between the Roman Empire and India* (Cambridge, 1928). See also H. G. Rawlinson, *Intercourse between India and the Western World* (Cambridge, 1916); K. A. Nilakanta Sastri, *The Cōlas*, I (University of Madras, 1935); and P. T. Srinivas Iyengar, *History of the Tamils from the earliest times to 600 A.D.* (Madras, 1929).





*Arikamedu: Northern Sector in middle distance, Southern Sector in background*



A. *Arikamedu from the west : Southern Sector in right background*

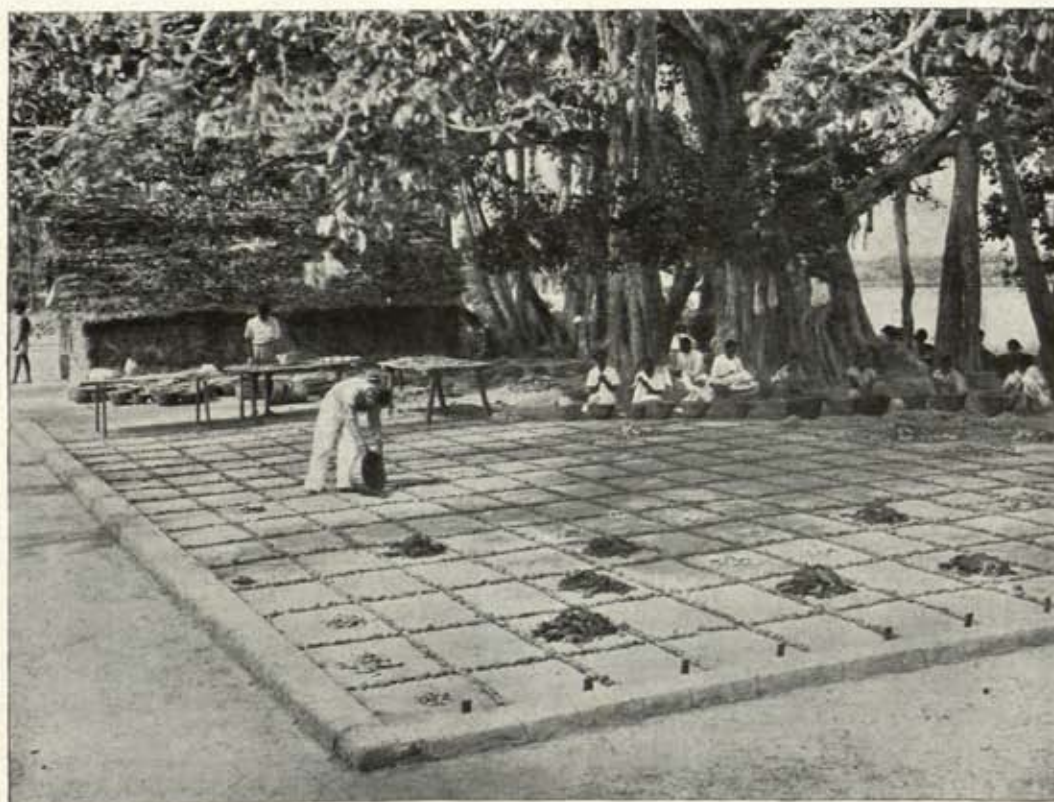


B. *Arikamedu : walls projecting from river bank*



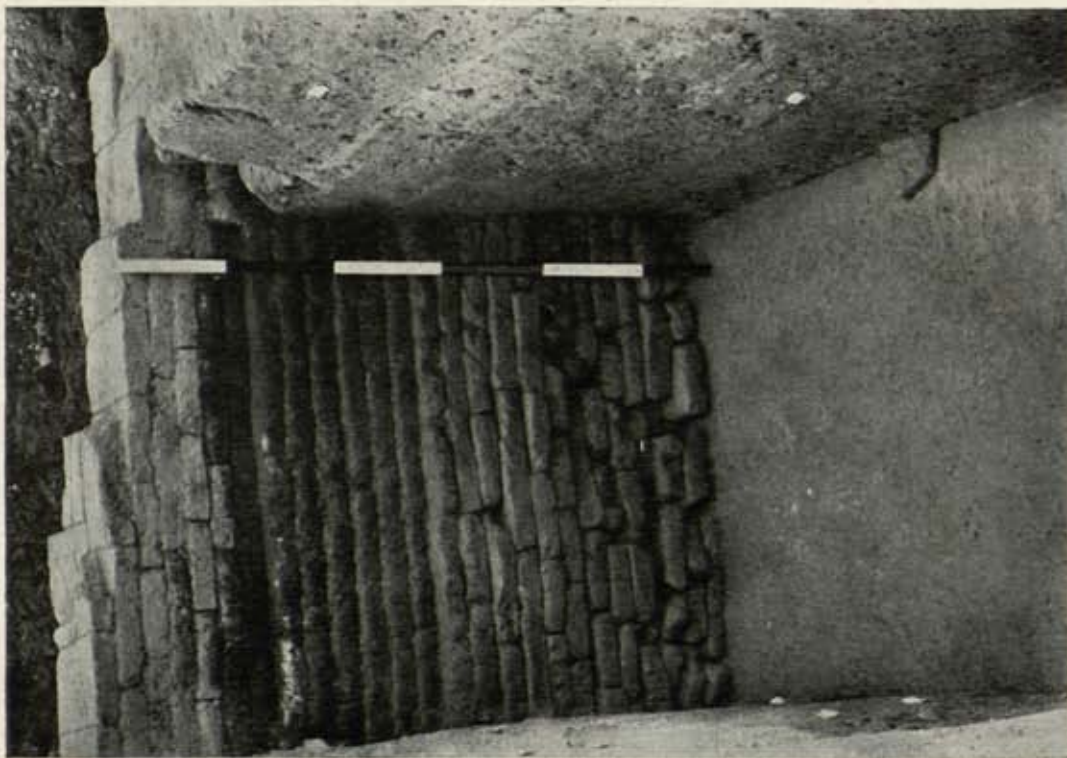


A. Site AK IV

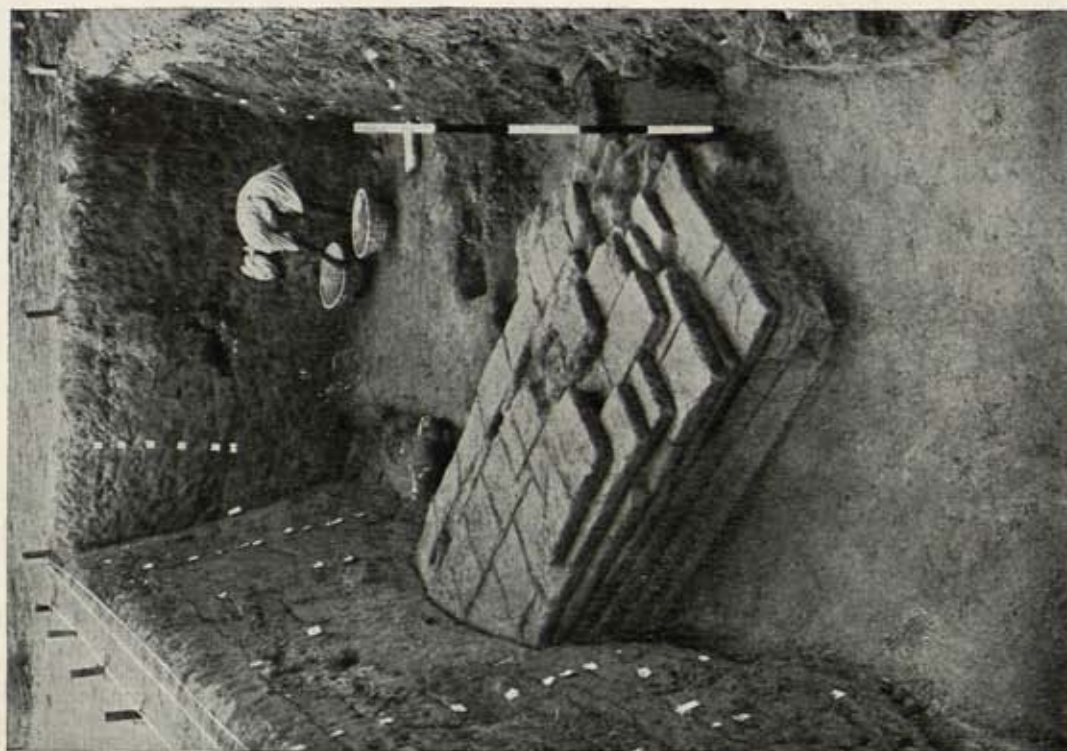


B. Pottery deposited for examination in squares numbered with the horizontal and vertical locations of strata





A. Northern Sector : south-eastern wall of 'warehouse' (AK V)



B. Northern Sector : north-eastern wall of 'warehouse'



60–100) speaks of ἐμπόρια νόμιμα, the unqualified ἐμπόρια of Ptolemy (c. A.D. 150), which may fairly be described as treaty-ports.<sup>1</sup> That is to say, permanent lodges of Western traders<sup>2</sup> were settled in them under formal agreement with the appropriate Indian ruler, and were visited at the proper seasons by convoys of deep-sea merchantmen. And just as the agents of the Portuguese, Dutch, Danish, French or British establishments in the days of the Companies travelled widely in the interior to circumvent the middlemen, so we may with probability recognize in some of the Roman coin-hoards far from the sea (fig. 48) the penetration of earlier Western traffickers with similar intent.

On the scale indicated, this organized interchange implies a knowledge of the periodicity of the monsoons. Without that knowledge, which, according to Pliny,<sup>3</sup> could restrict the crossing of the Indian Ocean to forty days, the laborious coastal voyage to India or the still more precarious overland routes must have prevented the development of regular and direct trade with southern or eastern India. The establishment of permanent agencies in those parts must therefore have post-dated the discovery of the so-called 'Hippalus' or south-western monsoon; a discovery of unknown date but appreciably earlier than Pliny and the *Periplus*, and possibly, though not certainly, earlier also than c. A.D. 21, when Strabo speaks of 120 ships sailing for India from Myos Hormos on the Red Sea.<sup>4</sup> On the other hand, there is no hint that the monsoon was familiar to Mediterranean merchants before the time of the Roman principate. The unification of the western world under Augustus (23 B.C.–A.D. 14) and the recorded reception by him of at least two Indian delegations (c. 25 B.C. and 21 B.C.)<sup>5</sup> provide an obvious context, if not for the actual discovery, at least for its diffusion beyond the corporations of Arab sailors and other agents who had jealously monopolized the Indian traffic thitherto.

Further than this the literary evidence fails to carry us. Warmington conjectures from it that the direct route from the Red Sea to the Malabar coast, i.e. the full use of the monsoon, was introduced 'soon after 41'.<sup>6</sup> Archaeology now indicates a rather earlier date. Some considerable time prior to the abandonment of the manufacture of Italian red-glazed pottery (Arretine and related fabrics)—an event which is unlikely to have been later than A.D. 50—a Roman emporium is now known to have been firmly established far up the eastern coast of India, near Pondicherry. We may infer that at least as early as c. A.D. 30, and possibly before the death of Augustus, regular monsoon-trade had been established between the Mediterranean and western India, with a coastwise or overland extension to the Coromandel coast. Whether at this early date the route was carried to its logical conclusion in Malaya and China is at present unknown. By the second century, at any rate, Antonine coins would appear to have penetrated to Long Shuyen and the peninsula of Cochin China, where they were dug up by Mr. L. Mallaret in 1945.<sup>7</sup>

Before we turn to the Pondicherry site, the literary picture of these trading-cities may be completed in outline by reference to one or two familiar passages in the Tamil literature. This literature is very insecurely dated, but the relevant passages, which are numerous, may be ascribed on general grounds to the early centuries A.D. It was probably in the second century, for example, that the city of Puhār or Kāvērippaṭṭinam, at the mouth of the Kāvērī river 60 miles south of Pondicherry, was thus described in the epic *Śilappadikāram* ('The Lay of the Anklet'): 'The sun shone over the open terraces, over the warehouses near the harbour and over the turrets with windows like the eyes of deer.'

<sup>1</sup> Warmington, p. 107.

<sup>2</sup> At Muziris (Cranganore, Cochin State) the *Peutinger Table*, second to third century A.D., marks a 'temple of Augustus'.

<sup>3</sup> VI, 104. <sup>4</sup> II, V, 12.

<sup>5</sup> The Monumentum Ancyranum states that such embassies came 'frequently'.

<sup>6</sup> Op. cit., p. 45.

<sup>7</sup> Information from Mr. H. Gervais, of the École Française d'Extrême-Orient.



# PRINCIPAL PLACES MENTIONED IN THE ARIKAMEDU REPORT

SCALE OF MILES  
100 50 0 100 200 300 400

HEIGHTS ABOVE 1500 FEET

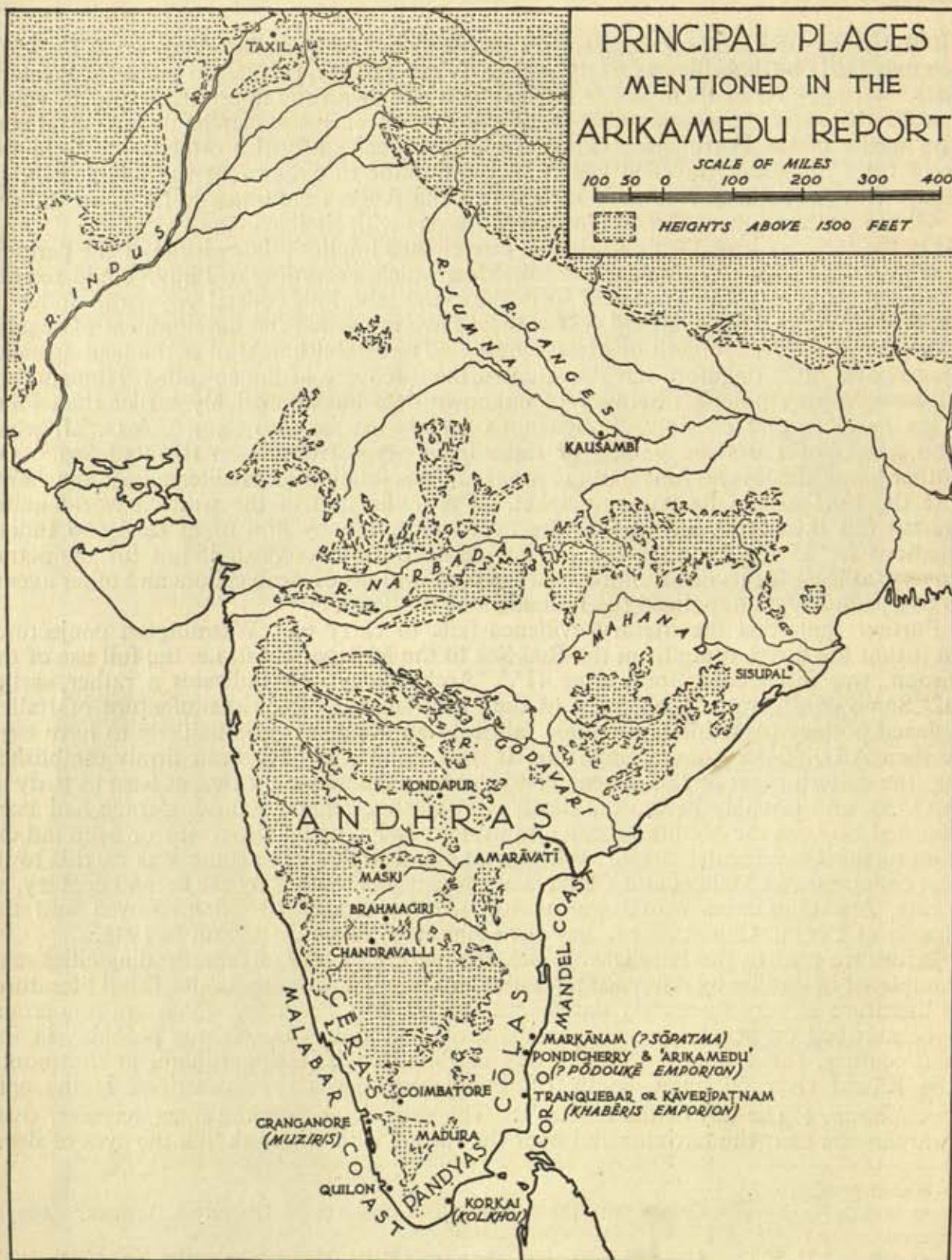


FIG. 1



In different places of Puhār the onlooker's attention was arrested by the sight of the abodes of Yavanas [men from the Graeco-Roman world] whose prosperity never waned. At the harbour were to be seen sailors from distant lands, but to all appearance they lived as one community . . . .'.<sup>1</sup> In another poem, a Pāṇḍya prince is exhorted to drink the cool and fragrant wines brought by the Yavanas in their vessels.<sup>2</sup> Again, 'agitating the white foam of the Pēriyāru, the beautifully built ships of the Yavanas came with gold and returned with pepper, and Muziris resounded with the noise'.<sup>3</sup> And Tamil rajas employed bodyguards of western mercenaries, 'the valiant-eyed Yavanas whose bodies were strong and of terrible aspect' and who, equipped with 'murderous swords', were 'excellent guardians of the gates of the fort-walls'.<sup>4</sup> In this capacity they are said to have been employed at Madurā. Yavana craftsmen were also sought after in southern India, especially for the manufacture of siege-engines.<sup>5</sup> In one way and another, the Yavana *in partibus* enjoyed a considerable prestige whether as trader or as settler.

\* \* \* \* \*

Two miles south of the centre of Pondicherry, the capital of French India, a former outlet of the Gingee or Varāhanadī river forms a lagoon locked to-day, save in full flood, by a sand-bar from the Bay of Bengal. The lagoon, known as the 'Ariyānkuppam river' from the name of the largest adjacent village, is fringed by cocoanut-palms which, with a belt of sand-dunes, shelter it mostly from the sea. In the vicinity of the little village of Kākkāyantōppu, the eastern bank of the lagoon stands some 20 feet above the water and from the scarp project the jagged ends of successive brick buildings to which the mound or *mēḍu* owes its being (pl. XB). To the villagers the site is known as Arikamedu, and, though no more formal origin for the name has been discovered, it will serve as well as any other.<sup>6</sup>

Destruction of the buried buildings by the river in flood has been accompanied by extensive destruction from other causes. Tree-planting and, above all, brick-robbing have combined in the work. As far back as 1734 there is record of the latter process,<sup>7</sup> and fragments of Chinese celadon ware of the ninth to twelfth centuries found in 'robber-trenches' throughout the excavated site indicate a similar process as early as the Middle Ages. To-day, the nucleus of the site is protected by the French Government.

In the eighteenth century the visible remains were described by Le Gentil,<sup>8</sup> who incidentally remarks upon their destruction by the river. But archaeological attention was first directed to the site by Mr. G. Jouveau-Dubreuil who, in and after 1937, made a collection of beads and gems found on the surface by the local children. One of the gems is reported to bear a head of Augustus in intaglio, and this induced Mr. Jouveau-Dubreuil to exclaim 'Nous avons là une véritable ville romaine'.<sup>9</sup> In the sequel, excavations were carried out in and after 1941 by Brother L. Faucheux of Pondicherry in collaboration with Mr. R. Surleau, then Chef des Travaux Publics. The excavators ignored stratification

<sup>1</sup> *The Śilappadikāram*, trans. V. R. Ramachandra Dikshitar (Oxford, 1939), p. 110.

<sup>2</sup> K. Pillai: *The Tamils eighteen hundred years ago*, pp. 12 and 37; Iyenger, op. cit., p. 312.

<sup>3</sup> Iyenger, p. 312.

<sup>4</sup> *Ib.*, p. 313; and Warmington, p. 80.

<sup>5</sup> Iyenger, pp. 313ff.

<sup>6</sup> Mr. K. R. Srinivasan has suggested that the name may be *Arukkumēḍu*, meaning 'mound of ruins' (*arukku*=to destroy or ruin); or it may be *Arukumēḍu*, meaning 'mound on a river bank' (*aruku*, according to old usage still surviving in Pondicherry—see Tamil Lexicon under *Aruku-Kollai* and *Arukadigam*—signifies the neighbourhood or bank of a river).

<sup>7</sup> L. Faucheux, *Une vieille cité indienne* (Pondicherry, 1945), p. 2.

<sup>8</sup> *Voyage dans les mers de l'Inde* (Paris, 1779-81), I, 542-5.

<sup>9</sup> *Bulletin de l'École Française d'Extrême-Orient*, XL (1941), 450. Mr. Jouveau-Dubreuil's collection was sent to the French School museum at Hanoi, Indo-China, and I have not seen the Augustus gem.



and no accurate plan was prepared, but the work had the primary merit of proving in bulk the real importance of the site and of revealing the presence of pottery from the Mediterranean. An untrimmed intaglio representing Cupid and an eagle, of classical workmanship, was also found (pl. XXXIIB, 11).

On a visit to Pondicherry in 1944 I observed several sherds of Italian red-glazed ware (the so-called Arretine) amongst the proceeds of the excavations exhibited in the town library.<sup>1</sup> Since this ware can be dated with some precision, it was evident to me that here we had for the first time what had long been sought in vain, namely, a firm datum-line in pre-medieval South Indian archaeology. For with the imported material was an Indian culture which necessarily shared its date. It remained to define that association by careful digging.

Accordingly, through the British Consulate at Pondicherry I approached the French authorities for permission for the Archaeological Survey of India to carry out a restricted excavation. H.E. the Governor (Mr. L. Bonvin) readily granted the request, and the work was carried out in April, May and June, 1945. From Brother Faucheux and from Mr. G. Julia, now Chef des Travaux Publics, and his staff the most generous help was received throughout the proceedings. The work was directed by myself as Director General of Archaeology in India, with the assistance of Mr. A. Ghosh, Superintendent of the Excavations Branch of the Archaeological Survey, Mr. Krishna Deva, Pottery Assistant to the Survey, and the following senior students of the Survey: S. C. Chandra, S. R. Das, D. P. Guha, B. B. Lal and B. K. Thapar. About twenty-five students and attachés from the Indian universities and States also took part in the work.

## 2. THE CHRONOLOGY OF THE SITE

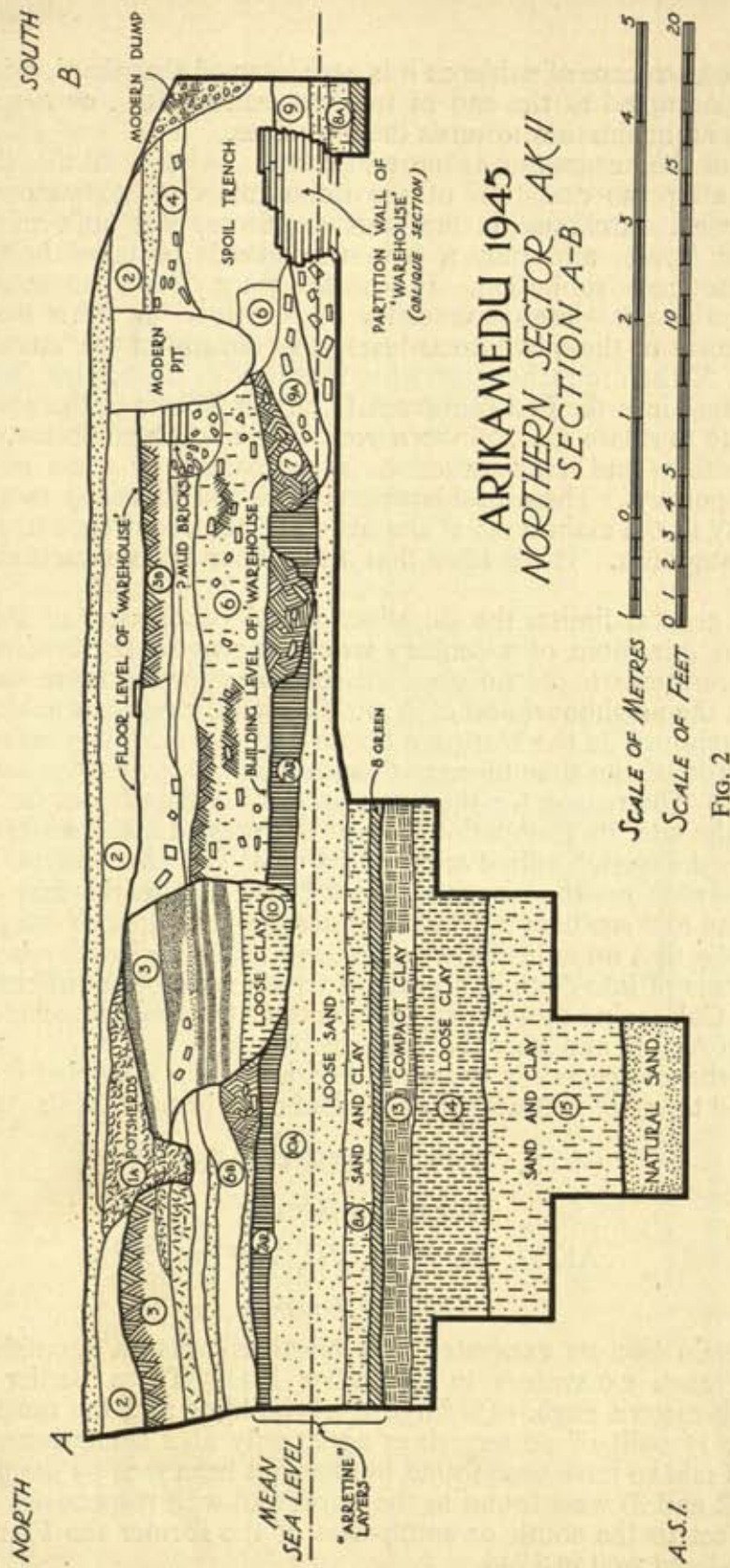
The imported pottery which dates the site consists of (a) Arretine ware from Italy, and (b) amphorae from Italy or elsewhere in the Mediterranean. Since the occupation was manifestly continuous through the period when Arretine ware was reaching the site into the period when the importation ceased, it is reasonable to regard the disappearance of the ware as due to stoppage at source rather than to any local condition at Arikamedu. It is inferred therefore that the Arretine imports belong to the last phase of the industry, and the three decades A.D. 20-50 are here suggested as a liberal estimate of the period covered by them.

Below the lowest Arretine-producing stratum on AK II, however, were 8 feet of sandy deposits representing mainly the accumulation of estuarine silt but nevertheless containing relics (fig. 2). All save the lowest of these deposits (which contained very little) yielded sherds of Mediterranean amphora. It may be affirmed therefore that a reasonably regular trade with the West was maintained substantially from the beginning of the occupation, but that, on present showing, the finest foreign ware (Arretine) did not appear at once upon the scene.

At this point we fall back upon the less certain support of historical probability. The historical indications are that the consolidation and development of Roman trade with the East was a product of the unification of the western world under Augustus (23 B.C.-A.D. 14), and it is reasonable to suppose that previous trade with eastern India, if it existed at all, was of a spasmodic and indirect kind—unlikely, for example, to have produced a continuous supply of amphorae at Arikamedu. On historical grounds, therefore, the Roman occupation of this site is unlikely to have antedated the principate of Augustus; i.e. unlikely to be earlier than 23 B.C.

<sup>1</sup> R. E. M. Wheeler, 'Virāmpatnam', *Journ. of the Greater India Society*, XI (1945), 91ff.







Thus from a convergence of evidence it is here inferred that the riparian sites excavated in 1945 were first occupied at the end of the first century B.C. or beginning of the first century A.D., with an inclination towards the later date.

The duration of the occupation is more in doubt. Almost all the buildings excavated were constructed after the cessation of the importation of Arretine ware. The large building, here called a warehouse, in the Northern Sector was built on and into the main Arretine-producing layers, and only a few stray sherds occurred in the contemporary 'make-up' or subsequent spoliation. In the Southern Sector all structures, save two fragmentary walls, also post-date the cessation of Arretine. In other words, the intensive structural development of these two areas belongs to the end of the 'Arretine period', here ascribed to c. A.D. 50 (before rather than after that date). This helps, incidentally, to drag down the initial phase into the first century A.D., in preference to the preceding century.

Subsequently to our date A.D. 50 there were, in the Southern Sector, several successive stages of construction and reconstruction, accompanied by some modification of the associated Indian pottery. These developments were controlled by two unifying factors: a general continuity in the main units of the plan, and the occurrence in all strata of sherds of Mediterranean amphora. It is evident that the function and contacts of the site remained unchanged.

Within these general limits, the duration of the occupation of the site in years is anyone's guess. A minimum of a century would appear to be required by the changes indicated, but there seems to be no good reason for allowing more than two centuries. A terminal date in the neighbourhood of A.D. 200 would be a reasonable supposition.

The great 'warehouse' in the Northern Sector had vanished long before this date, and a pit, full of potsherds of the first to second centuries A.D., had been cut into the remains of one of its walls. The reason for the doom of this building is not far to seek; it lies at the lower end of the site, its foundations are at the present mean sea-level, and, although its floor was, from the outset, raised to a height of  $4\frac{1}{2}$  feet above them, it must have been liable to flooding—even on the necessary assumption that in the first century A.D. the relative level of land and sea here differed considerably from that of the present time.

It is noteworthy that no coins have been found in the ancient levels of the site. Only in the extensive areas of late disturbance, due to systematic brick-robbing in medieval and modern times, do Coła coins occur with fragments of the Chinese celadon ware which is almost universal in Asia in and after the ninth century A.D.

In summary, the site generally is assumed to have been occupied during the first two centuries A.D., and to have been despoiled for its bricks in the Middle Ages and later.

### 3. THE STRUCTURES

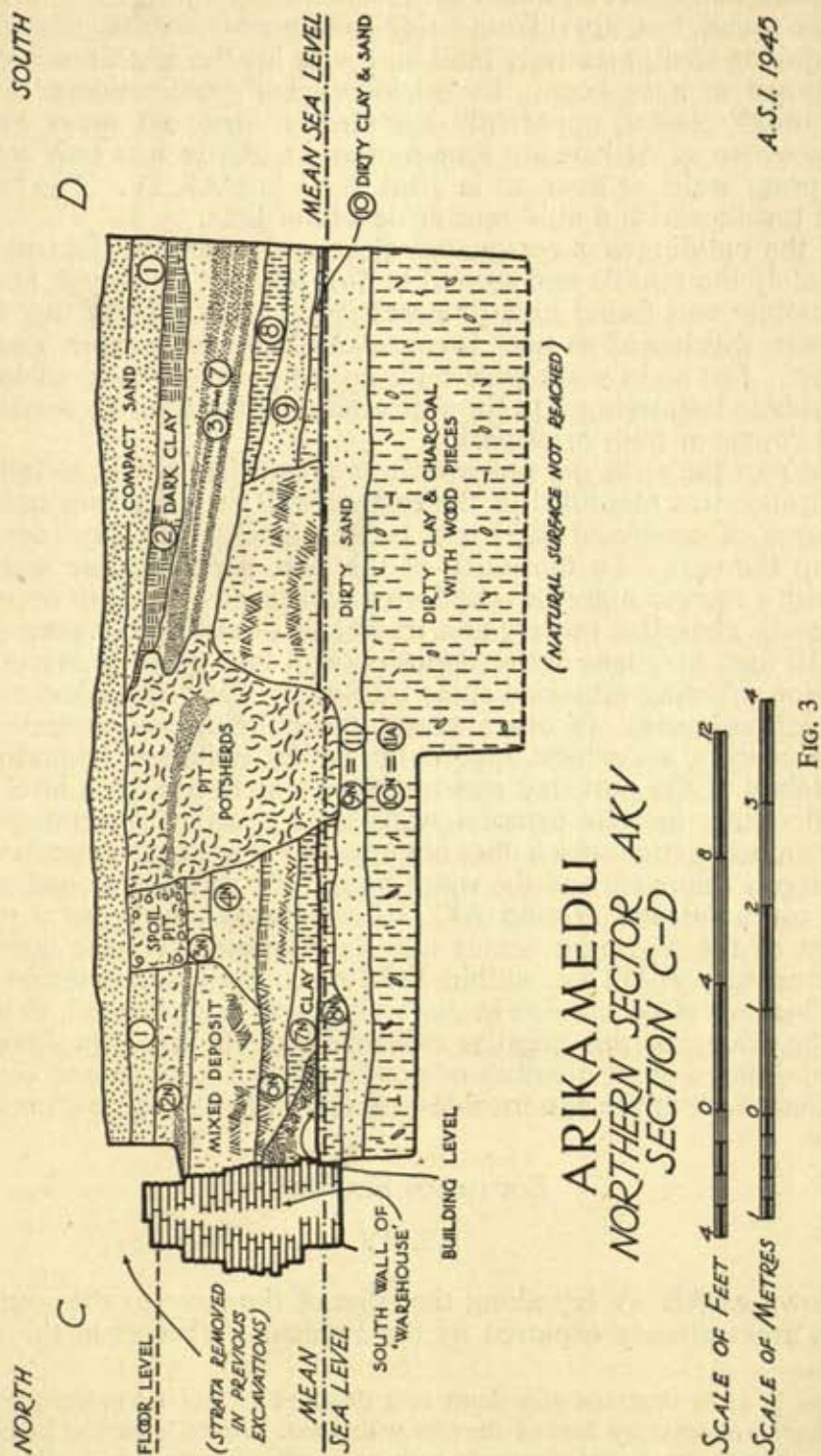
#### NORTHERN SECTOR

#### AK II, III, V, VI, VII, VIII AND X

##### *The 'warehouse'*

Of the two main Sectors excavated, the Northern was an amplification of an area cleared by the French excavators in and after 1941. These earlier excavations had disclosed the south-eastern angle of a large brick building and the remains of a ring-well or soak-pit (R.W. 1) built of pottery rings apparently at a somewhat earlier period. A second ring-well is said to have been found but has not been seen by the present excavators. Two more (R.W. 2 and 3) were found to the north and west respectively of the building in 1945, and a few feet to the south or south-west of the former the French claim to have discovered a brick-lined well in 1944.







As now revealed the building, largely destroyed by brick-robbers and curtailed by the river, was a featureless structure upwards of 150 feet long (pl. XIII). Traces of a single partition-wall were found, but, apart from a side-chamber towards the east, the building was substantially an oblong shell, massively built and with all the appearance of a warehouse, which it is presumed to have been. Its brickwork had been rendered externally by its builders with a tough plaster, apparently intended to keep out water on this low-lying site; at least, elsewhere at Arikamedu lime-mortar or plaster was only used when it was desired to waterproof walls or floor, as in Tank A on Site AK IV. The bricks themselves were mostly held together with a mud-mortar devoid of lime.

The date of the building was reasonably clear and has been discussed above, p. 24. It was approximately the middle and second half of the first century A.D.

No later structure was found here or hereabouts. It is evident that the 'warehouse' was built on a site which was as near to water-level as was feasible, and that the latter was already rising. The main walls were built on rough foundations of bricks which had been sunk on a rubble bottoming into the soft sand, and the floor-level was 4 feet 6 inches above the lowest course of built brickwork.

For the most part the walls did not remain to a sufficient height to indicate doorways, but a former entrance was identified in the eastern wall of the side-chamber by a gap, at which a thick layer of concreted sand and broken bricks probably represented a street approaching from the east. To the north of this gap, a rectangular mass of brickwork partly covered with concrete suggested the former existence of a ramp or staircase here.

Below sea-level,<sup>1</sup> abundant pottery and fragments of cut timber were found to a depth of no less than 10 feet, but these lower deposits, with two possible exceptions at the top, gave the impression of being estuarine slime into which the objects had sunk, rather than submerged occupation-layers. In other words, the building was erected actually on the foreshore of the estuary, on which apparently timber buildings had already stood and into which the débris of the port had penetrated; it was floored at a level high enough to escape normal flooding, and its external walls were specifically reinforced to keep out water; but, after an occupation which does not appear to have been extensive, it was disused, its bricks were largely removed, and the water-logged site was abandoned, whilst the higher ground to the south (at and around AK IV) remained in use. At a reasonable guess, the abandonment of the Northern Sector may be supposed to have occurred before the end of the first century A.D., i.e. within little more than a generation of the date of construction. Evidence of occupation in the 'warehouse' is slight, and, although superficial disturbance of the area robs this negative evidence of certainty, it is significant that Pit 1 of AK VIII, containing a great quantity of potsherds of first to second century types, was cut into the southern wall of the eastern side-chamber of the building after its demolition.

## SOUTHERN SECTOR<sup>2</sup>

### AK IV

The site known as AK IV lay along the edge of the river to the south of the second of the two main areas already explored by the French. Whereas in the Northern Sector

<sup>1</sup> Our excavation in loose sand and clay down to a depth of 13 feet below sea-level was fraught with difficulties, which were overcome by fencing the area with planks, driven lower and lower as the excavation proceeded, and by pumping out water constantly with an excellent pump lent by the Travaux Publics of Pondicherry.


<sup>2</sup> This section of the report is contributed by Mr. A. Ghosh.

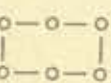


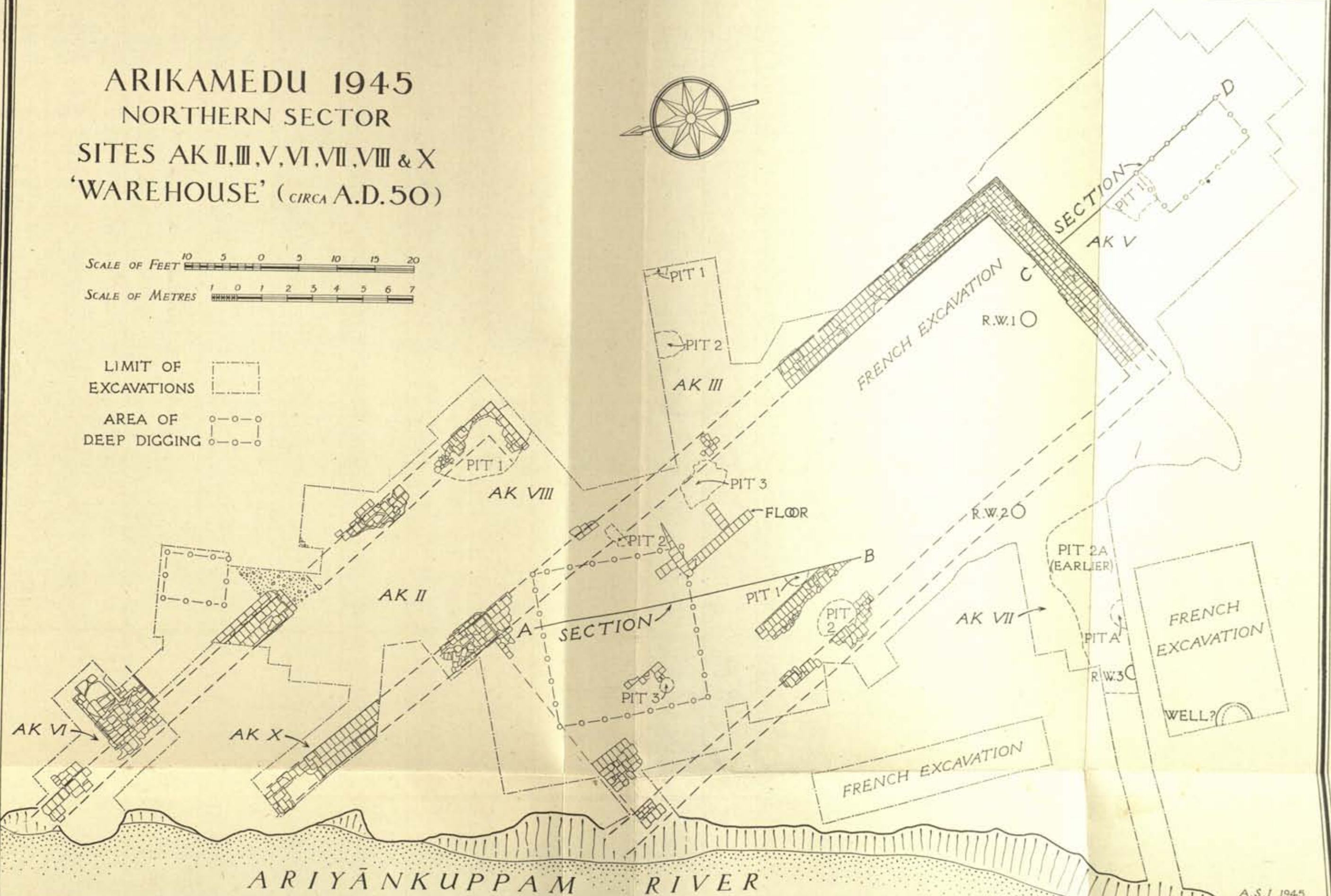
ARIKAMEDU 1945  
NORTHERN SECTOR  
SITES AK II, III, V, VI, VII, VIII & X  
'WAREHOUSE' (CIRCA A.D. 50)

SCALE OF FEET 10 5 0 5 10 15 20

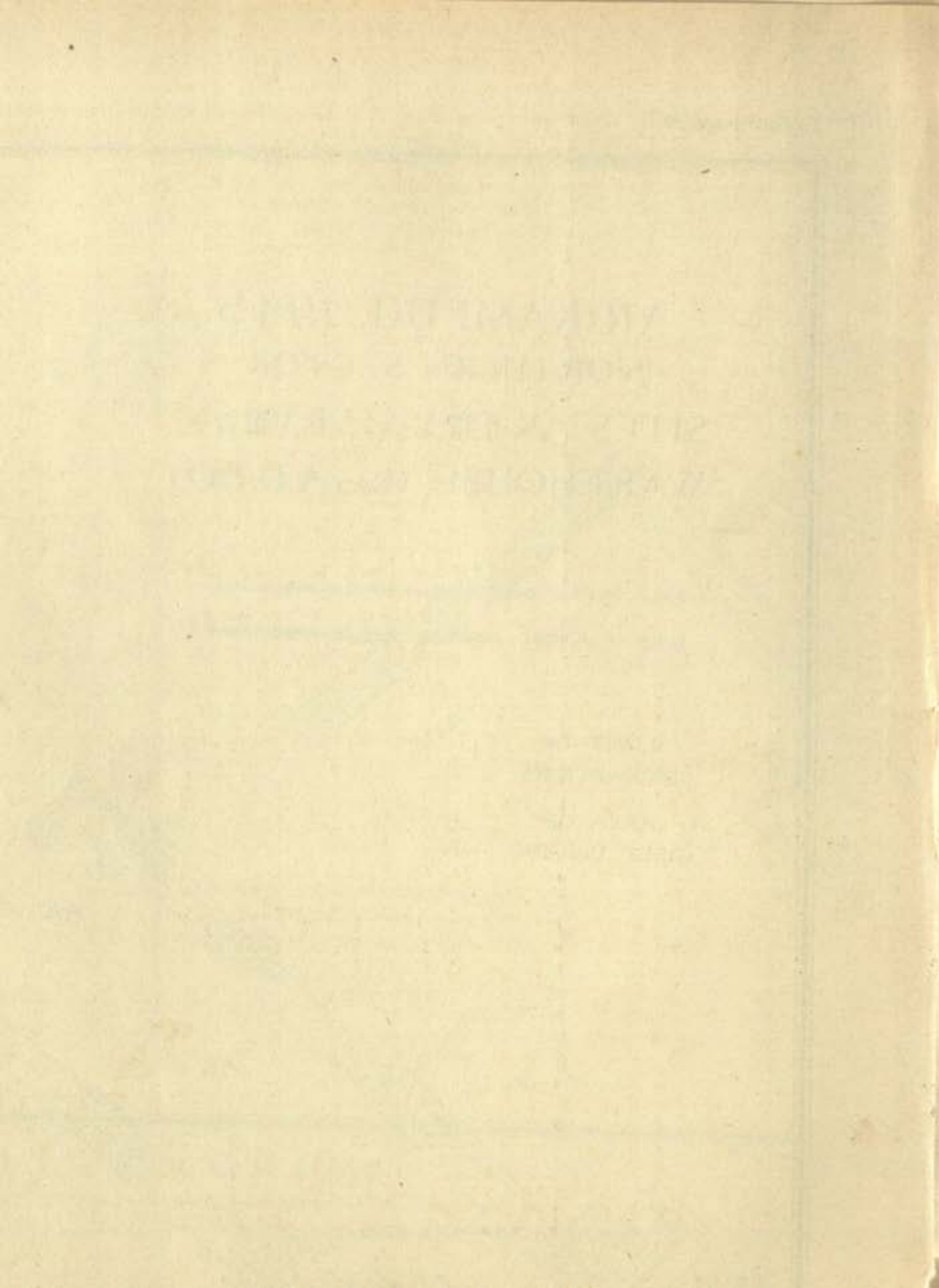
SCALE OF METRES 1 0 1 2 3 4 5 6 7

LIMIT OF  
EXCAVATIONS 

AREA OF  
DEEP DIGGING 









evidence of occupation penetrated to a depth of 9 feet to 10 feet 6 inches below sea-level, here the natural soil was found at an average height of 10 feet above sea-level. On this higher site, less accessible for the work of the port but out of reach of flood, the evidence of pottery indicates that occupation began a little later than on the foreshore but continued after the foreshore was abandoned. It falls into three main Phases, Early, Middle and Late, with sub-periods, but it should be emphasized at once that there was no break in its continuity, unless between the Middle Phase and the very slight remains constituting the Late Phase.

### *Early Phase*

The Early Phase may be divided into three sub-periods.

*Sub-period 1.*—The earliest structures were separated from the natural sand by a deposit of greenish sand 3 feet thick, rather poor in pottery and other small finds. The remnants of this sub-period were very few and did not yield any structural plan. They consisted of (1) a fragmentary wall carrying three square blocks of brickwork which doubtless supported wooden posts; (2) a ring-well (R.W. 1) near the southern end of the wall; and (3) a patch of brick floor (Floor A) near by; all the three were to the south of Tank A of the next sub-period; and (4) a wall in the open space between Tanks A and B, entirely over-built by a wall of the next sub-period. An important feature of this wall was that it contained five irregular vertical chases in its eastern face, showing that it was built against wooden posts and roughly cut to fit them. This method of reinforcing an essentially timber structure by a brick 'skin' was repeated in later buildings in the Sector.

At the end of this sub-period a shallow but wide pit was cut into the ground immediately to the west of the wall first mentioned above. This pit yielded a very large quantity of pottery (Group A), which included several interesting sherds, notably a fragment of stamped Arretine, several pieces of amphora, and a sherd with a Prākṛit inscription (see below, pp. 36, 43 and 111).

*Sub-period 2.*—This sub-period witnessed brisk building activity. The main feature was the construction of two complexes of pavements called Tanks A and B, each with an adjacent room of uncertain purpose. Both continued to be repaired and restored till the last sub-period of the Middle Phase. Throughout their existence they seem to have lain at the edge of two large and apparently unroofed quadrangles. They had a close family-likeness to each other and must have been used for similar purposes. The extensive use of drains or conduits and substantial pavements of large bricks apparently made for the purpose, and the absence of domestic features, indicate the probability that the site was used for industrial purposes involving a constant inflow and outflow of water. It is likely enough, though not proved, that the tanks were used as cisterns or vats for dyeing the muslin which formed one of the most important exports of this part of India in ancient times.<sup>1</sup> The yards may have been used for drying the cloth.

Tank A (fig. 4 and pls. XXA, XXIA) was originally paved with bricks four courses deep and plugged with clay and had a doorway in its eastern wall. The portion of the wall to the north of this doorway had an irregular outer face, having been built against wooden posts resting on a single course of bricks. The western and part of the southern walls had an irregular footing, indicating that a part of the tank had been built against the sides of an excavation below ground-level. There is no evidence as to how water was drained out of the tank in this period.

<sup>1</sup> For the use of brick tanks in the present muslin industry in the Madras Presidency, see p. 34. For Indian muslin exports in classical times, see Warmington, *op. cit.*, pp. 210-12.



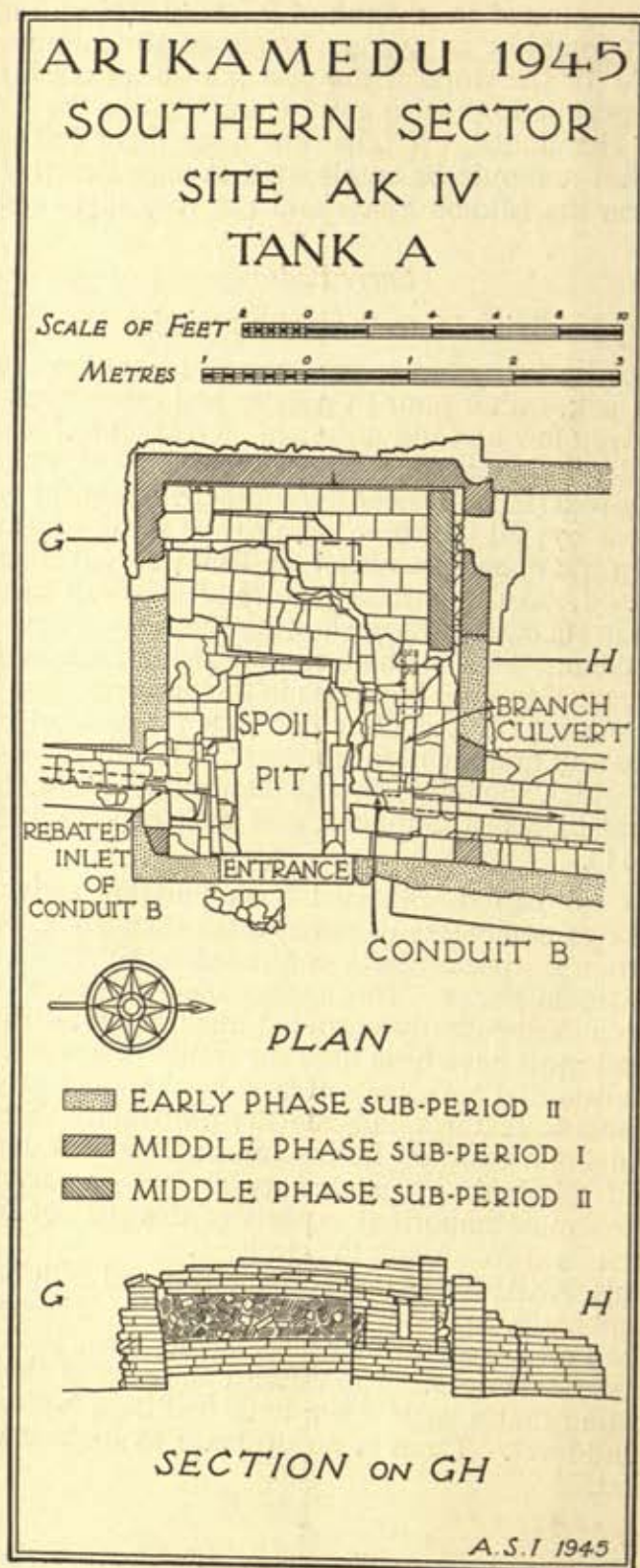
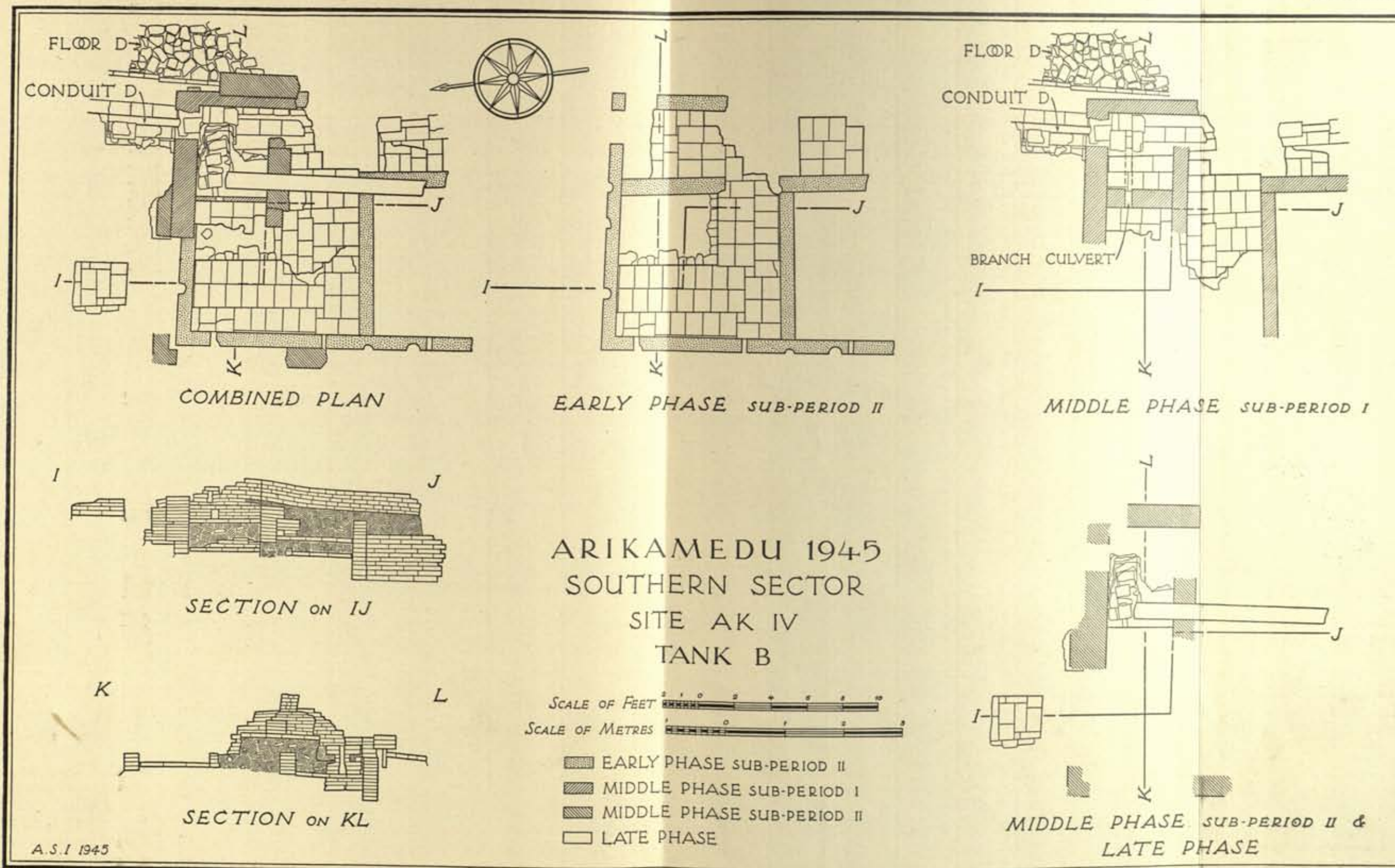


FIG. 4











Only the southern half of the quadrangle of which the tank formed part was traceable, the northern half having been entirely eroded. The southern wall of this enclosure, which partly overlay the earlier ring-well (R.W. 1), had the same feature as the discarded wall of the earlier period (No. 1 above), in that it supported two square brickwork bases for posts.

Tank B (pls. XVI, XXB), in addition to an unpaved square or oblong chamber to its south, had a paved verandah to its east. The western and northern enclosing walls were built against wooden posts indicated by the semicircular chases cut in their outer faces. Near the junction of the northern and eastern walls there was a doorway opening into the verandah. The partition-wall between the verandah and the tank also had a doorway, flanking either side of which were two holes cut into the floor which were no doubt meant to receive wooden posts forming door-jambs.

A rectangular portion of the north-eastern corner of the tank was left unpaved and contained a platform edged with fragmentary bricks and 9 inches higher than the floor of the tank (pl. XVI). If the conjecture that the two tanks were used for dyeing muslin is correct, this platform may have been used to support a vat.

The tank was drained by two channels in its western wall.

Between Tanks A and B there was a long but fragmentary and unconnected wall, built upon an earlier wall (No. 4, above) and sharing with it the characteristic of having irregular chases in its eastern face and having therefore been originally built against rough wooden uprights. The chases in this wall, however, did not tally in detail with those of the earlier wall, and it is thus evident that a complete reconstruction was involved. It is likely that this new wall served as the western compound-wall of the quadrangle of which Tank B formed part.

Against the outer face of the wall was Conduit A built of two rows of bricks on edge, placed 10 inches apart and capped by horizontal bricks. This is the earliest remnant of the system of drainage which was to become a distinctive feature of the site.

In the French excavation at the northern end of the site, a fragmentary square or oblong structure of uncertain purpose, seven ring-wells (R.W. 2 to 8), and a patch of brick floor (Floor C on plan) may be ascribed to this period on general considerations, although no stratigraphic evidence is preserved.

Of the other extremely fragmentary structures of this period, viz. a brick floor (Floor B) and an isolated wall in the southern extremity of the explored area and two walls in the eastern portion, no coherent plan could be traced, owing to extensive brick-robbing.

*Sub-period 3.*—The only structure of this sub-period was a wall immediately to the west of the earliest ring-well (R.W. 1). The southern end of this wall overlay the southern wall of the earlier quadrangle. As it was thus later than sub-period 2 and was stratigraphically earlier than the Middle Phase, it has to be regarded as an unconnected structure of the last days of the Early Phase.

### *Middle Phase*

Subsequently to the last period of the Early Phase the site underwent considerable devastation at the hands of brick-robbers, as underlying the structures of the Middle Phase were found four large pits full of brick-fragments (indicated on the plan as Quarry Pits A, B, C and D, cf. pls. XVIII B, XIX A). This, however, does not imply a general abandonment of the site and its occupation by new settlers. On the contrary, as has been said above, the continued use and elaboration of the two tanks and the renewal of old walls built against wooden posts by similar walls in the Middle Phase indicate a persistence of the essential structural features through the subsequent periods.

The Middle Phase consists also of three sub-periods.



*Sub-period I.*—This sub-period became known to the excavators as the 'Drain Period', since it was characterized by the construction of an elaborate system of drainage, sloping north towards the river. In construction all the new drains or conduits, unlike Conduit A of the Early Phase, were constructed by means of corbelled walls (not single bricks on edge), floored and roofed with horizontal bricks.

Conduit B, built upon the ruined top of the eastern wall of the quadrangle of Tank A, first discharged itself into Tank A, whence the water was emptied by another conduit built in line with it through the opposite wall. The end of the inlet was rebated and its side-walls were provided with slits for a wooden sluice-gate (pl. XXIA).

From the extant fragments of the southern end of Conduit C it seems that it had first a northern course; then, after a short turn to the east, it turned again to the north and overlying the earlier Conduit A ran approximately along the median wall between Tanks A and B, which was built upon the earlier wall with chases for timbering and itself had the same characteristic (pl. XXIIA). In fact, this wall and Conduit C were essentially restorations of the corresponding earlier structures.

Conduit D, originating like the others somewhere outside the excavated area, ran through the eastern portion of Tank B, utilizing the earlier floor of the tank as its floor and proceeded northwards till it reached the northern terminal wall of the quadrangle within which Tank B was situated. Beyond this point it continued with a slightly different orientation (as Conduit E), till, crossing a probable street, it discharged itself into a wider cross-drain (Conduit F) which came from the east and probably formed part of the main drainage-system of the town. The point of junction with the main drain was indicated by a gap in the latter (pl. XIXB). It is likely that further west Conduits B and C similarly joined Conduit F.

The relation of Conduit B with Tank A has been described above. The floor of the tank was now raised by 1 foot 4 inches over the earlier floor, the intervening space being filled up by débris. The new floor was drained by a branch-culvert, the entrance to which was stopped by a small square brick plug.

The southern, western and northern walls of the tank were now rebuilt upon the corresponding earlier walls. The outer face of the last wall contained two chases, indicating the position of posts against which it had been built. The eastern wall was missing: it is likely, however, that it too followed the alignment of the earlier wall.

In Tank B, the eastern wall was replaced by a new wall with practically the same alignment and the northern wall was thickened. The partition-wall between the tank and the southern room continued without alteration.

Within the walls of the tank important changes were effected. The partition-wall between the tank and the verandah was discarded, and a new east-to-west wall was erected, partitioning the room into two long strips. Both strips were floored with bricks, the new floors being separated from their predecessors by a deposit of brick-bats and earth. The floor of the northern strip was 8 inches higher, indicating that it now took the place of the earlier platform.

The northern strip itself was divided into two halves by a cross-wall, through which ran a subsidiary drain or conduit taking off from the western half and joining Conduit D through a hole made into one of its cap-bricks. It holds the same position as the branch-culvert in Tank A. The history of the two tanks is thus *mutatis mutandis* identical.

A paved floor outside the eastern wall of the tank, made of fragmentary bricks and edged with bricks on edge, also belongs to this sub-period.

Though the fragmentary remnants render the reconstruction of a complete plan of the sub-period impossible, the general lay-out is fairly clear. Tank B seems to have formed part of a large quadrangle, the wall against which Conduit C was built forming its western

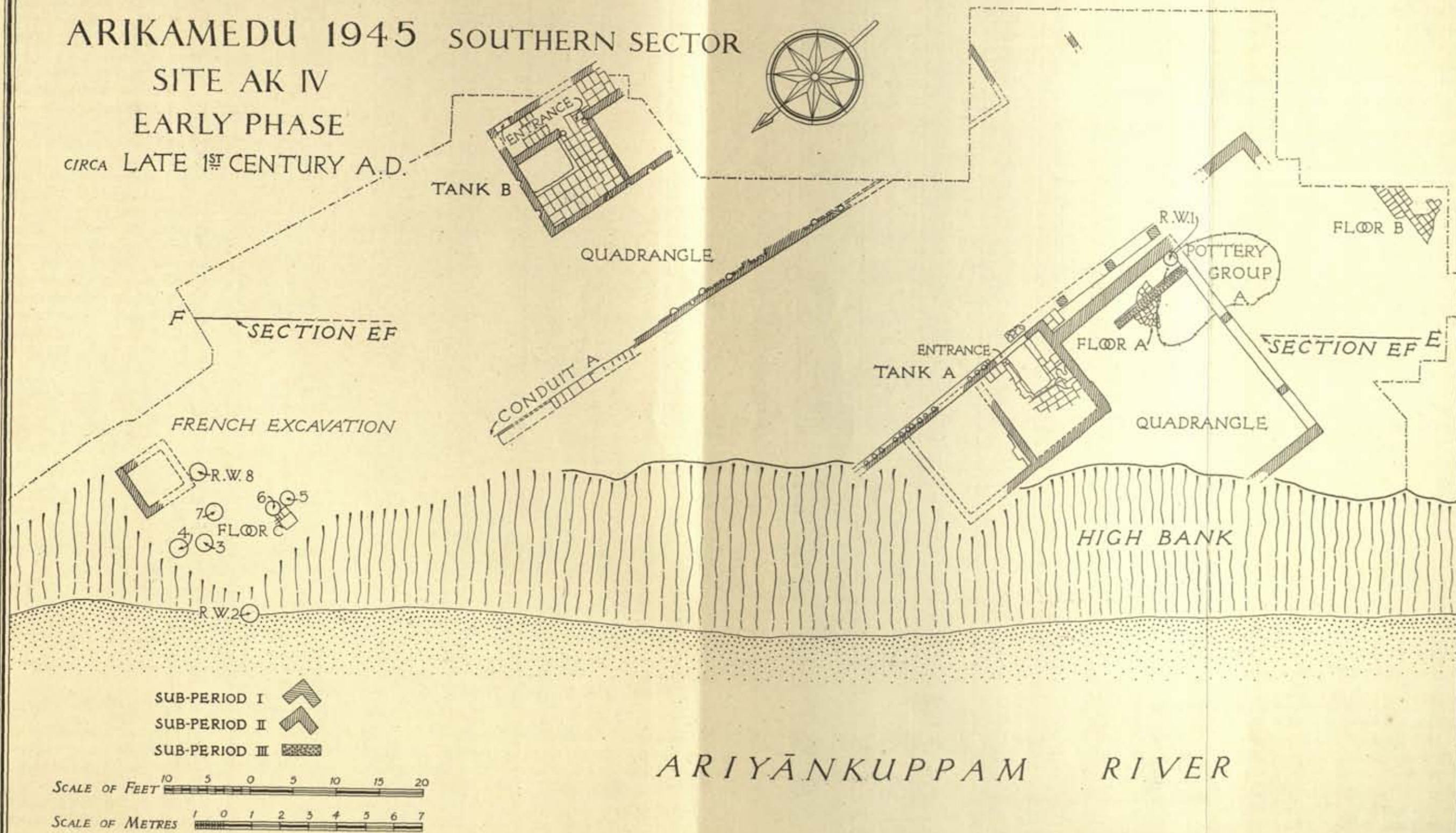


# ARIKAMEDU 1945 SOUTHERN SECTOR

SITE AK IV

EARLY PHASE

CIRCA LATE 1<sup>ST</sup> CENTURY A.D.



SUB-PERIOD I

SUB-PERIOD II

SUB-PERIOD III

SCALE OF FEET 10 5 0 5 10 15 20

SCALE OF METRES 1 0 1 2 3 4 5 6 7

ARIYANKUPPAM RIVER







wall. This wall had two corner projections against its eastern face, indicating the existence of a few small rooms within the quadrangle.

The inner (southern) face of the northern wall of the quadrangle was very rough and was doubtless built against timbering. The eastern wall had regular outer and inner faces, against the latter of which Conduit D was built. The entire length of the southern compound wall was missing, but its position could be guessed from a corner projecting from the western wall.

Flanking the northern wall of the quadrangle was probably a street, with Conduit F running through it.

Unlike Tank B, no quadrangle could be ascribed to Tank A in this period, though it may be assumed from the fact that there was one both in the preceding and the succeeding periods. Three rectangular blocks of brickwork near the eastern face of Conduit B may represent the remnants of a series of piers or posts holding a roof or pent.

The open space between Tank A and the western wall of the quadrangle of Tank B might naturally have been regarded as a street meeting the main east-to-west street mentioned above but for the fragmentary corner of a structure standing in its middle.

In the French excavations immediately to the north of the site, the only buildings of this period were a square structure (Lined Pit A), 9 feet 5 inches deep, gradually narrowing towards the bottom, and a drain (Conduit G) taking off from its lip. The pit is similar in construction to another one (Lined Pit B) found by us and belonging to the next sub-period.

*Sub-period 2.*—In this sub-period, Tank A was provided with a still higher floor, which finally sealed the opening of the outlet-drain of the previous sub-period. There is no evidence as to how water was drained off the floor.

The tank had now a quadrangle round it, as may be surmised from the existence of two walls to its south and west, at a distance of 19 feet respectively from the corresponding walls of the tank. The former had a door near its western end, and the latter was again built against wooden posts driven into holes cut into the ruined top of the wall of the Early Phase (pl. XVIIIA).

To the south of this quadrangle was a square structure, called Lined Pit B, 5 feet 9 inches deep. Its outer face was roughly built against the earthen sides of the pit; the smooth inner face had an inward batter, so that at the top the structure was 5 feet square and at the bottom only 1 foot 6 inches square (pl. XXIB). It seems likely that this pit as well as the somewhat earlier one in the French excavation (Lined Pit A) were used in connexion with the same industry as Tanks A and B (see above, p. 27).

The northern and western walls of Tank B, to judge from the fragmentary remains, were made thicker; a thick wall was also raised upon the ruined top of the earlier wall dividing the tank into two strips. The space between this and the northern wall was paved with brick-bats and provided with a drain, the outlet of which, however, was not clear.

The other unconnected and fragmentary structures of this period were a thick wall with semicircular recesses in its western face and a part of a small rectangular room of unknown purpose, both in the French excavations.

*Sub-period 3.*—The main building-activity of this sub-period was confined to the area beyond the southern wall of the quadrangle of Tank A. Along the outer face of this wall a west-to-east drain (Conduit H) was added. The source of the drain was uncertain; but after a breach of 15 feet it reappeared, utilizing one of the earlier walls and a floor (Floor E) built against it as one of its side-walls and floor, a new wall forming its other side. It sloped to join Conduit C of the 'Drain Period' at a point where the latter turned east.



Some brick floors of this period deserve mention. Floor F lay immediately to the north of Conduit H near its lower end. It was built of complete bricks, its sides consisting of bricks on edge. On the other side of the drain was Floor G built of brick-bats. Further west it seems to have been continuous with Floor H, which was similarly built against the same drain, and which, along with two walls of the same period meeting each other at an acute angle, overlay the top of the Lined Pit B of sub-period 2.

There is no evidence that the two tanks remained in use in this sub-period; on the other hand, there is no evidence to the contrary.

### *Late Phase*

All the periods from sub-period 1 of the Early Phase to sub-period 3 of the Middle Phase were connected with one another by structural links, such as similarity of alignment, the continued utilization of older drains, etc. But the last phase of occupation on the site revealed no such connexion with the earlier episodes. It was essentially a period of decay, when a few stray structures, lightly and clumsily built of brick-bats, took the place of the earlier tanks and drains. At the same time, there was very little accumulation of material between the Middle and Late Phases, and there is no good reason for assuming a wide divergence of date between them.

Besides stray walls, three ring-wells (R.W. 9, 10 and 11), all in the southern portion of the site, belonged to this Late Phase. It is likely that all the ring-wells were originally surrounded by brick-floors, R.W. 9 by Floor I, superimposed upon Floor H of the earlier period, and R.W. 10 and 11 by Floor J, only a small patch of which was found near by.

### AK I

Unlike the other excavated areas, AK I was situated inland, being at a distance of about 60 yards from the river-bank (pl. VIII). Here an area of 40 feet by 40 feet was partially excavated to the natural soil, which was reached at an average depth of 9 feet from the surface. Slight traces of structural remains belonging to three phases were found. The area had, however, been so thoroughly disturbed by brick-robbers at various periods that the trial was not extended.

An interesting feature of this otherwise unpromising site was the discovery at a low level of a cluster of eight pointed-bottom jars (type 75 below, p. 77, and pl. XXXIII A), irregularly distributed within an area of 4 square feet. Some of them were fitted into the broken remains of others.

### DIMENSIONS OF BRICKS

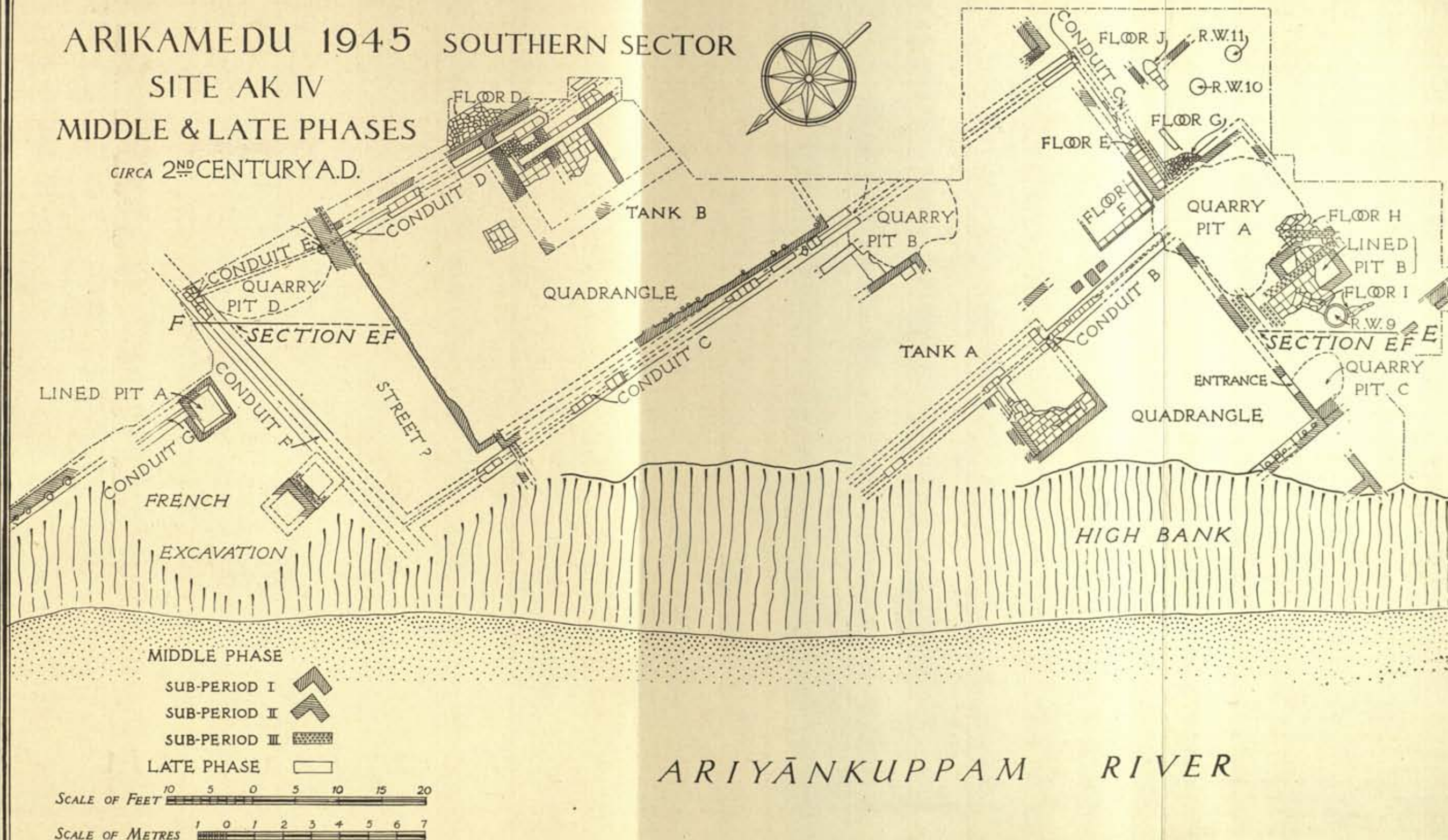
A very large number of bricks was measured, and the appended chart gives the dimensions in inches of those used in walls, drains and pavements of different periods. Besides the maxima and minima of the three dimensions, the chart gives the normal size of bricks in each case. A mathematical average is liable to produce an entirely artificial figure and has been avoided.

Hasty conclusions as to chronology have often been based upon brick-measurements, but, until large numbers of bricks have been carefully measured on a large number of dated sites and the results critically considered, these conclusions are invalid. The tables here printed may perhaps serve as a fresh starting-point.

It will be seen that in the middle of the first century A.D. at Arikamedu (Northern Sector), the normal size was 2.5" to 2.9" thick, 14.0" to 15.0" long and either 8.0" to 8.5" or 10.5" to 11.0" broad. The earliest bricks in the Southern Sector, which probably originated a little later in the first century, are 2.7" × 13.0" to 13.5" × 9.0" and are evidently a different batch. Thereafter there is no appreciable change until sub-period 2 of the Middle Phase (probably second century A.D.), when there is a tendency for the bricks (perhaps re-used) to grow rather larger again, with superficial dimensions 14.0" to 15.5" × 9.0" to 9.5" or 10.5" to 11.0". Pavement bricks had already in sub-period 2 of the Early Phase been 2.7" to 3.0" × 15.0" to 16.0" × 10.5" to 11.0".



CIRCA 2<sup>ND</sup> CENTURY A.D.









## NORTHERN SECTOR

	Max.	Min.	Normal
Length ..	18-0	11-0	14-0 to 15-0
Breadth ..	11-0	7-2	8-0 to 8-5 10-5 to 11-0
Thickness ..	3-0	2-4	2-5 to 2-9

## SOUTHERN SECTOR

## Early Phase

	Sub-period 1			Sub-period 2			Sub-period 3		
	Walls			Pavements			Walls		
	Max.	Min.	Normal	Max.	Min.	Normal	Max.	Min.	Normal
Length ..	13-5	13-0	13-0 to 13-5	14-0	13-0	13-0 to 13-5	17-0	12-0	15-0 to 16-0
Breadth ..	9-0	9-0	9-0	9-0	8-8	8-8 to 9-0	11-5	9-0	10-5 to 11-0
Thickness ..	3-0	2-5	2-7	3-0	2-5	2-7	3-0	2-5	2-7 to 3-0

## Middle Phase

	Sub-period 1						Sub-period 2			Sub-period 3		
	Walls			Drains			Pavements			Walls		
	Max.	Min.	Normal	Max.	Min.	Normal	Max.	Min.	Normal	Max.	Min.	Normal
Length ..	16-5	12-5	13-0 to 13-5 14-0 to 14-5 15-0 to 15-5	17-5	13-0	14-0 14-5 15-5	16-0	14-5	15-5 to 16-0	17-5	13-0	14-0 to 15-5
Breadth ..	11-0	8-0	8-5 9-0 11-0	11-0	8-5	8-5 9-5 10-5	11-0	10-5	10-5	11-0	8-5	9-0 to 9-5 10-5 to 11-0
Thickness	3-5	2-2	2-5 to 2-7	3-0	2-5	2-7	3-0	2-5	2-7 to 3-0	3-0	2-2	2-7 to 2-8



In all these measurements every possible care has been taken to exclude obviously re-used bricks, but the risk of 'dilution' from this cause in the later periods is always present. The only bricks which were certainly and uniformly new at the time of construction are those of the Northern Sector; of the Southern Sector, Early Phase, sub-period 1; and of the pavements of Southern Sector, Early Phase, sub-period 2.

#### NOTE ON THE USE OF TANKS IN THE TEXTILE INDUSTRY IN THE MADRAS PRESIDENCY

With reference to the suggested use of Tanks A and B (above, p. 27) for the preparation of muslin cloth, the following answers to inquiries are worthy of record:—

1. Extract from letter dated the 22nd September, 1945, from the Business Manager, Handloom Weavers' Provincial Co-operative Society Ltd., 21 Sunkurama Chetty Street, G-T., Madras.

'Masonry tanks were considered to have no reaction to acids and salts in those days for indigenous dyeing, and they are in existence even now in some parts in South Arcot and Chingleput Districts in cases where much boiling is not required. The tanks may be square or rectangular in shape and the size will generally not exceed either  $3 \times 3 \times 3$  feet or  $3\frac{1}{2} \times 3$  feet so as to be easy for the workmen to do the work.'

2. Extract from letter dated the 24th September, 1945, from the Principal, Government Textile Institute, Washermanpet, Madras.

'Masonry tanks or cisterns are used for storing water or for dyeing by cold process when there is no need to heat the dye-bath by means of firewood.'

3. Extract from letter dated 22nd September, 1945, from the Secretary, All-India Spinners' Association, Andhra Branch, Masulipatam.

'For printing and dyeing blue colour, masonry tanks are used. The size of these would be generally 4 to 6 feet in length,  $2\frac{1}{2}$  feet in width and about 3 feet in depth. They will be rectangular in shape.'

4. Extract from letter dated 13th September, 1945, from the Curator, State Museum, Pudukkottai (S. India).

'Water and large vats or tanks were necessary (1) in the bleaching process—for the production of bleach liquor for soaking the fabric and washing; (2) in sizing and starching, for the boiling of the starch gruel from millets or rice and soaking the fabric; (3) in dyeing or printing, for the boiling of the dye and mordants, steeping the material and for washing it.'

## 4. THE POTTERY

### A. WARES IMPORTED FROM THE MEDITERRANEAN

Upon the imported Mediterranean wares the whole chronology of the site, and its special importance therefore to Indian archaeology, depend. Although the apparatus for an analytical and comparative study of these wares does not exist at present in India, their general significance is sufficiently familiar to enable them to be used immediately with adequate precision. They fall into three categories: (i) 'Arretine' ware, with imported copies, (ii) amphorae, and (iii) rouletted black ware, which, whether actually imported or not, shows foreign influence.

#### (i) *Arretine ware*

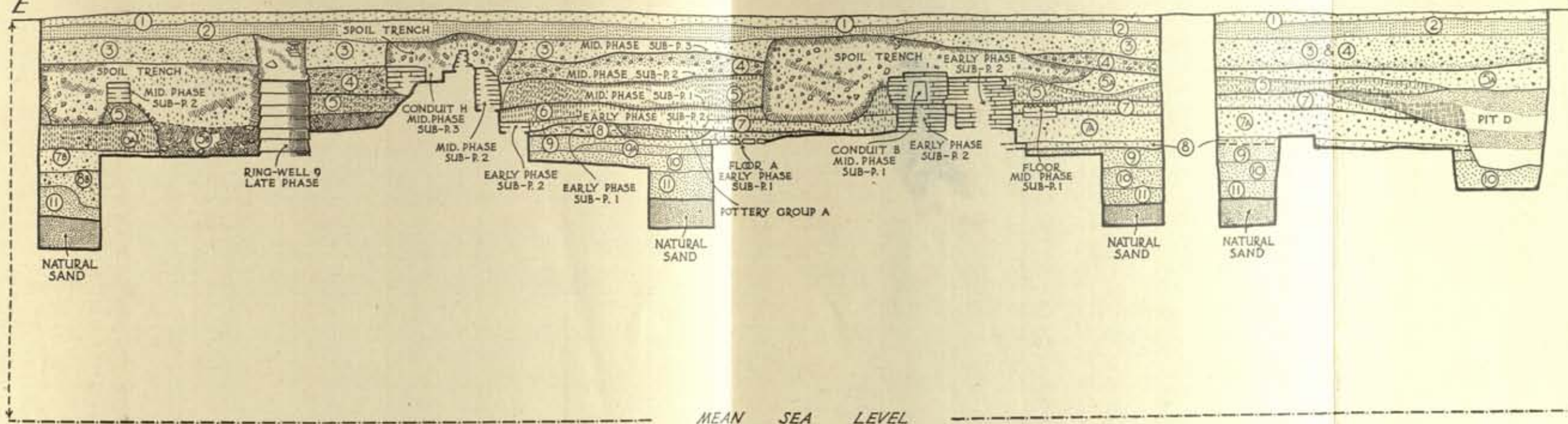
This is a red-glazed ware, the glaze varying from a sealing-wax colour through 'Indian red' to something approaching a deep orange-red; occasionally, in the first half of the first century A.D., the glaze is yellow with red veins, the so-called 'marbled' ware. Arretine ware belongs to a class of ware known as *terra sigillata* ('stamped pottery') from the fact that some of it is decorated by being pressed into a stamped mould. *Terra sigillata* belongs in origin to the eastern Mediterranean area, especially to the environs of the Aegean Sea, and assumes a number of forms and varieties of fabric and glaze which have not yet been adequately systematized. It seems to emerge in the second century B.C., and its derivatives survived in the Near East widely into the Byzantine period—as late as the seventh century



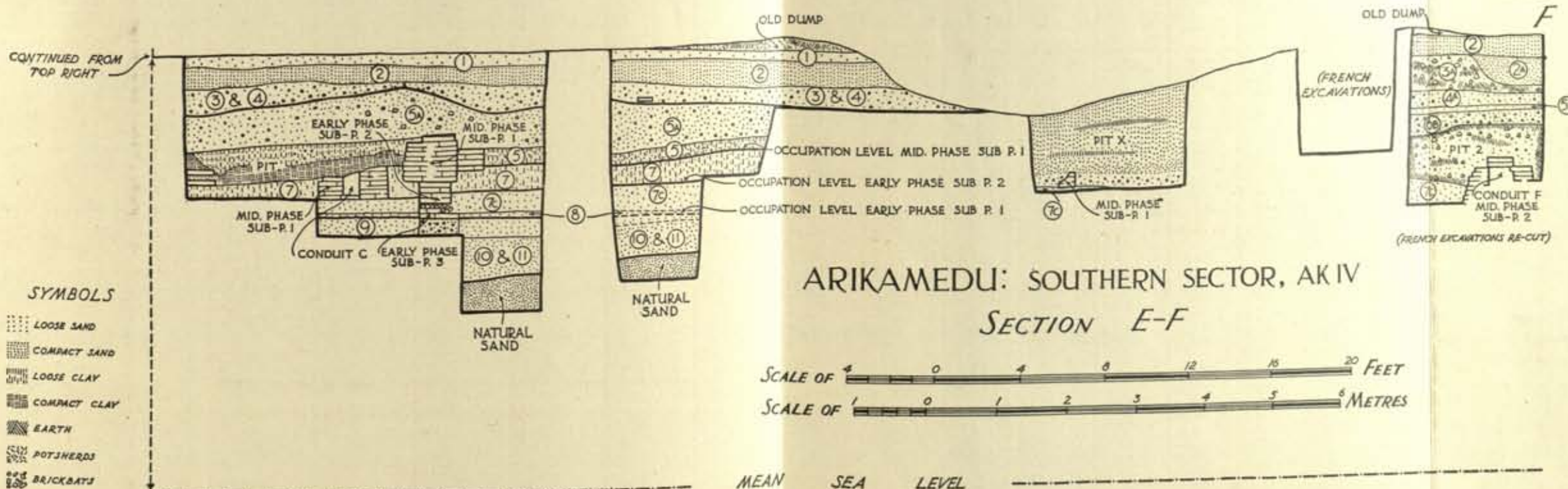
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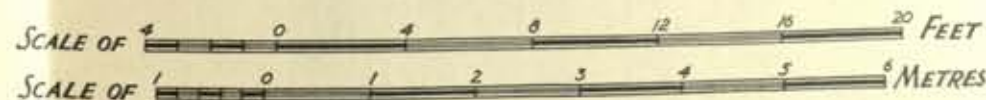
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# SYMBOLS

- LOOSE SAND
- COMPACT SAND
- LOOSE CLAY
- COMPACT CLAY
- EARTH
- POTTERIES
- BRICKS

## ARIKAMEDU: SOUTHERN SECTOR, AK IV SECTION E-F



MEAN SEA LEVEL







A.D. according to J. H. Iliffe, who has made a useful preliminary study of these provincial wares.<sup>1</sup>

At Arikamedu, however, we are concerned primarily with the highest category of metropolitan sigillata, namely, that which was produced in Italy, at Arezzo, Puteoli and elsewhere, and has been named 'Arretine' from the Latin name of Arezzo (Arretium).<sup>2</sup> This Arretine sigillata originated at an undetermined date probably in the first century B.C. By c. A.D. 25 it was confronted in western Europe by rival potteries established in Gaul, in some cases by the Italian potters themselves; and, though it lingered on until after the Roman invasion of Britain in A.D. 43, it was driven from the western market by A.D. 50.

In the East, where provincial rivalry may not have been at first so acute, it is possible (though not proved) that Arretine ware lasted a little longer. It is conceivable (though again not proved) that, in its simpler forms such as are normal at Arikamedu, the ware may even have been retained specifically for export-trade, like the celadon of medieval China (see below, p. 91). In the absence of alternative evidence, however, we must assume the general validity of the results of detailed study in western Europe, and must suppose that no Arretine pottery reached India after A.D. 50.

The literary record makes it clear that Romano-Indian trade remained brisk until long after the middle of the first century A.D. There is furthermore no break in the occupation of Arikamedu at the moment when Arretine ware ceased to arrive there. It is a fair inference therefore that the latest Arretine on the site belongs to the last phase of the production of the ware, i.e. c. A.D. 45-50; and, in considering the initial moment of Roman contact, we may reasonably argue backwards from that date. Such argument is necessarily somewhat subjective, but in the cutting where the evidence was clearest (AK II, see fig. 2) only four layers, all of them of sandy estuarine mud likely to have been deposited quickly, contained Arretine sherds, and little more than thirty years might be regarded as sufficient for their accumulation.

So far as it goes, the character of the pottery itself is consistent with this. Save for one tiny fragment, probably of Dragendorff's form 11, with leaf-pattern (fig. 7, 32 and pl. XXIV, 4), the sherds represent undecorated cups and dishes, in some cases even without the normal rouletting. These negative features may be regarded as symptoms of lateness; although it may also be supposed that only the cheaper products of the kilns were used for this overseas trade, particularly since the fabric was in any case technically superior to that of the Indian pottery of the period and would therefore find a ready market.

I have proposed therefore A.D. 20-50 as the inclusive period for the Arretine pottery at Arikamedu.

The stratum which produced most of the sherds of Arretine on site AK II (thirteen out of a total of eighteen from the cutting) is shown as '7 Ar.' on the section, fig. 2, and was approximately at the present mean sea-level. Below it, a succession of sandy deposits contained pottery to a further depth of 10 feet, beyond which clean sand, devoid of relics, was encountered. Of this further 10 feet, only the uppermost 2 feet (layers 8A, 8 green, and 11C) yielded sherds of Arretine, to the total number of four. There were thus still 8 feet of accumulation, the pottery from which did not include Arretine.

<sup>1</sup> 'Sigillata wares in the Near East', *Quarterly of the Department of Antiquities in Palestine*, VI (1938), 4ff.

<sup>2</sup> The phrase *vasa arretina* (Arretine pottery) was retained by the Romans in the sense of pottery *de luxe* even after the actual potteries of Arretium had ceased production. Standard references to this ware include H. Dragendorff, *Bonner Jahrbücher*, XCVI-XCVII (1895-6); S. Loeschcke, 'Keramische Funde in Haltern', *Mitteilungen der Altertums-Kommission für Westfalen*, V (Münster i.W., 1909); E. Ritterling, 'Das frühromische Lager bei Hofheim im Taunus', *Annalen des Vereins für nassauische Altertumskunde* (Wiesbaden, 1913); F. Oswald and T. Davis Pryce, *Terra Sigillata* (London, 1920).



Above stratum 7 Ar. only one sherd of Arretine was found in an undisturbed deposit: in stratum 5, which formed a part of the make-up of the floor-level of the 'warehouse', a brick building constructed on and into stratum 7 Ar.

Otherwise, the most significant occurrence of sigillata was on the main southern site, AK IV, where a stamped sherd immediately underlay a brick wall of the Early Phase.

By sites, the Arretine ware found during the present excavations was as follows (all from the Northern Sector except AK IV), together with some sherds from the previous excavations.

#### ARRETINE SHERDS, STRATIFIED. Fig. 5

##### AK II

##### (a) From the make-up of the floor of the 'warehouse'.

1. Fragment of flat base of dish. (AK II, 589.)

##### (b) From stratum 7 Ar.

2. Fragment of rouletted rim of Loeschcke type 2A. (AK II, 342.)
3. Flat base of dish possibly of similar type, stamped VIBIE (see p. 39). Indeterminate graffiti on under side of base. (AK II, 266.)
4. Fragment of similar dish. (AK II, 312.)
5. Fragment of carinated side of very thin, fine fabric, variant of Dragendorff type 8 or Loeschcke type 15. Approximates to a stamped example of Claudian date (A.D. 41-54) from Mainz (Oswald and Pryce, *op. cit.*, pl. XXXIX, 14). (AK II, 311.)
6. Minute sherd with internal groove, possibly fragment of Loeschcke type 10A, but too small for reasonable conjecture. (AK II, 344.)
7. Fragment of flat base of dish. (AK II, 343.)
8. Fragment of rouletted rim of Loeschcke type 2A or similar. (AK II, 314.)
9. Fragment of base-ring of dish. (AK II, 298.)
10. Indeterminate fragment of 'marbled' ware (yellow with red veins). This type of ware was being produced by Arretine potters at least as early as the beginning of the first century A.D. (see p. 34). (AK II, 506.) Not illustrated.
11. Fragment of Dragendorff type 17 or Loeschcke type 3B. (AK II, 587.)
12. Fragment of flat base of dish with ring of fine rouletted pattern on upper surface. (AK II, 587a.)
13. Fragment of variant of Loeschcke type 3B. (AK II, 530.)
14. Fragment of flat base of dish of 'marbled' ware. See above, under No. 10. (AK II, 410.)

##### (c) Layer 8A (prior to 7 Ar.).

15. Fragment of flat base of dish with incised line on interior. (AK II, 397.)

##### (d) Layer 11C (cut into and therefore later than layer '8 green').

16. Fragment possibly of variant of Loeschcke or Dragendorff type 8. Orange-red glaze. (AK II, 517.)

##### (e) Layer 8 green (lowest Arretine layer).

17. Fragment of flat base of dish. (AK II, 550.) Not illustrated.

##### AK IV

##### (f) Pottery Group A (earlier than the earliest, save one, of the brick structures on the site).

18. Base, form indeterminate, stamped ITTA (see p. 40). Fragmentary graffiti (svastika ?) on under side. The glaze is of mediocre quality and is orange-red. (AK IV, 154.)

##### AK V

##### (g) Pit 1, high up outside S. wall of warehouse.

19. Fragment of dish-like bowl, variant of Dragendorff type 24. Red glaze on exterior of rim, yellow glaze on interior, and possibly on exterior below rim. (AK V, 61.)





A. AK IV: wall of Early Phase, with post-holes and superimposed wall of Middle Phase

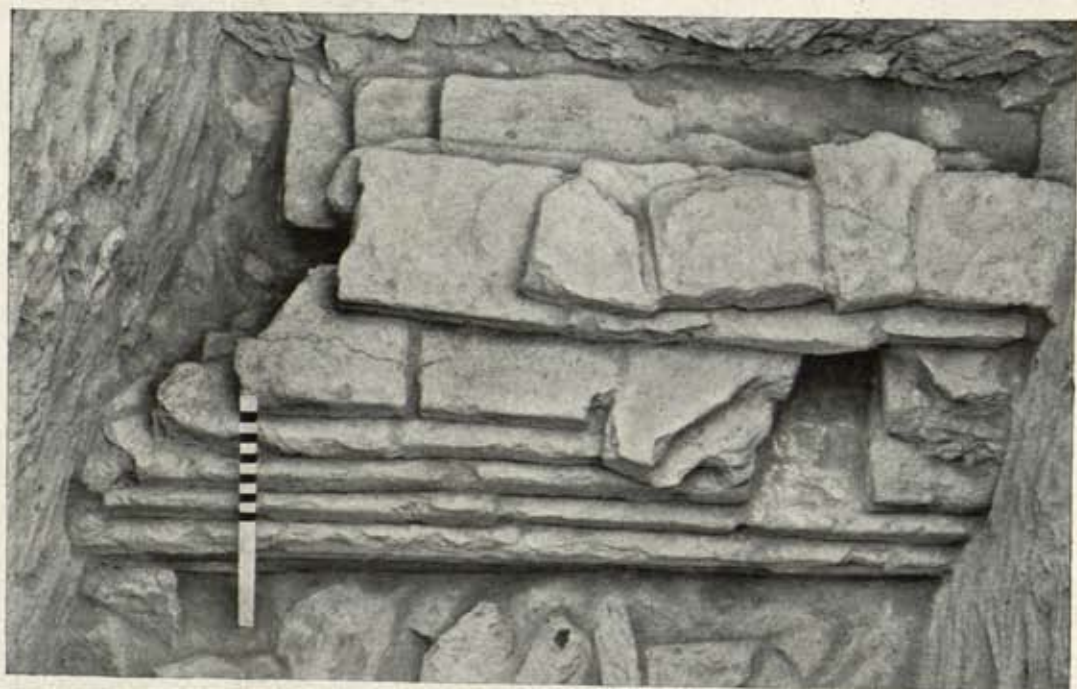


B. AK IV: wall of Middle Phase built over debris





A. AK IV: walls of Middle Phase built over 'quarry-pit A'



B. AK IV: 'conduit F' with junction of 'conduit E'



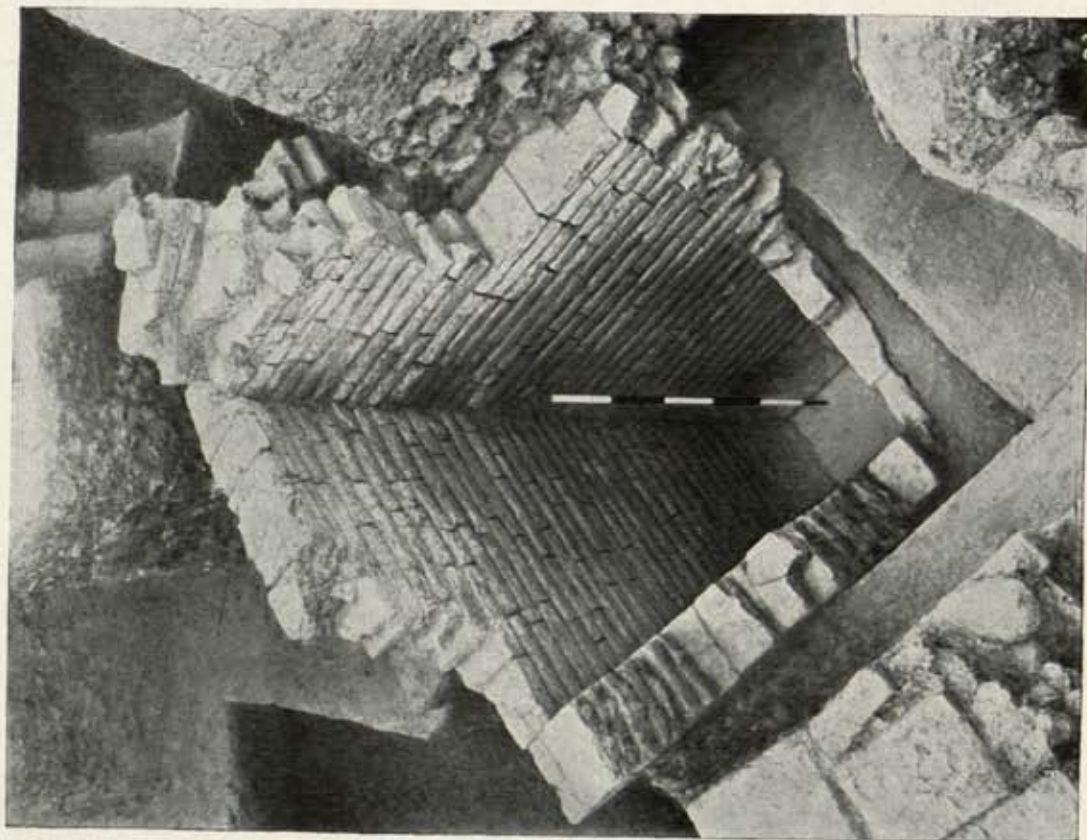


A. AK IV: 'tank A' showing two main periods of flooring

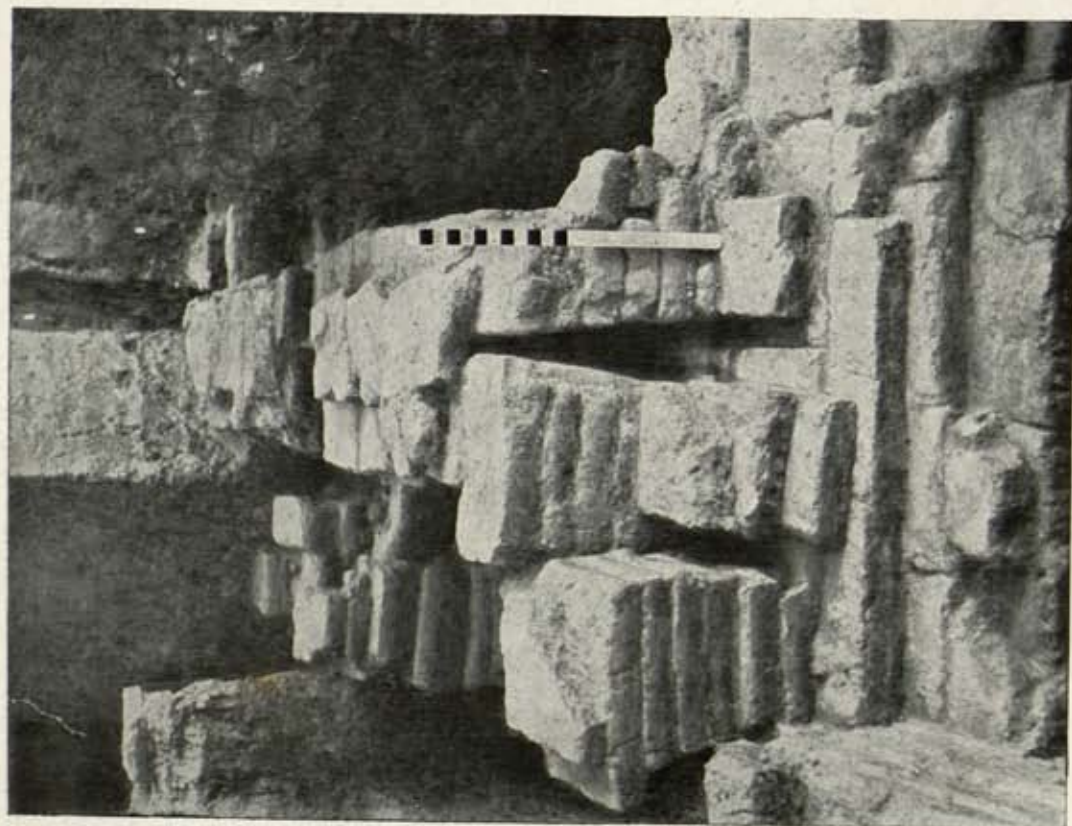


B. AK IV: 'tank B'. E.P.=Early Phase, M.P.=Middle Phase, L.P.=Late Phase





B. AK IV: 'lined pit B'



A. AK IV: 'tank A', rebated inlet of 'conduit B'



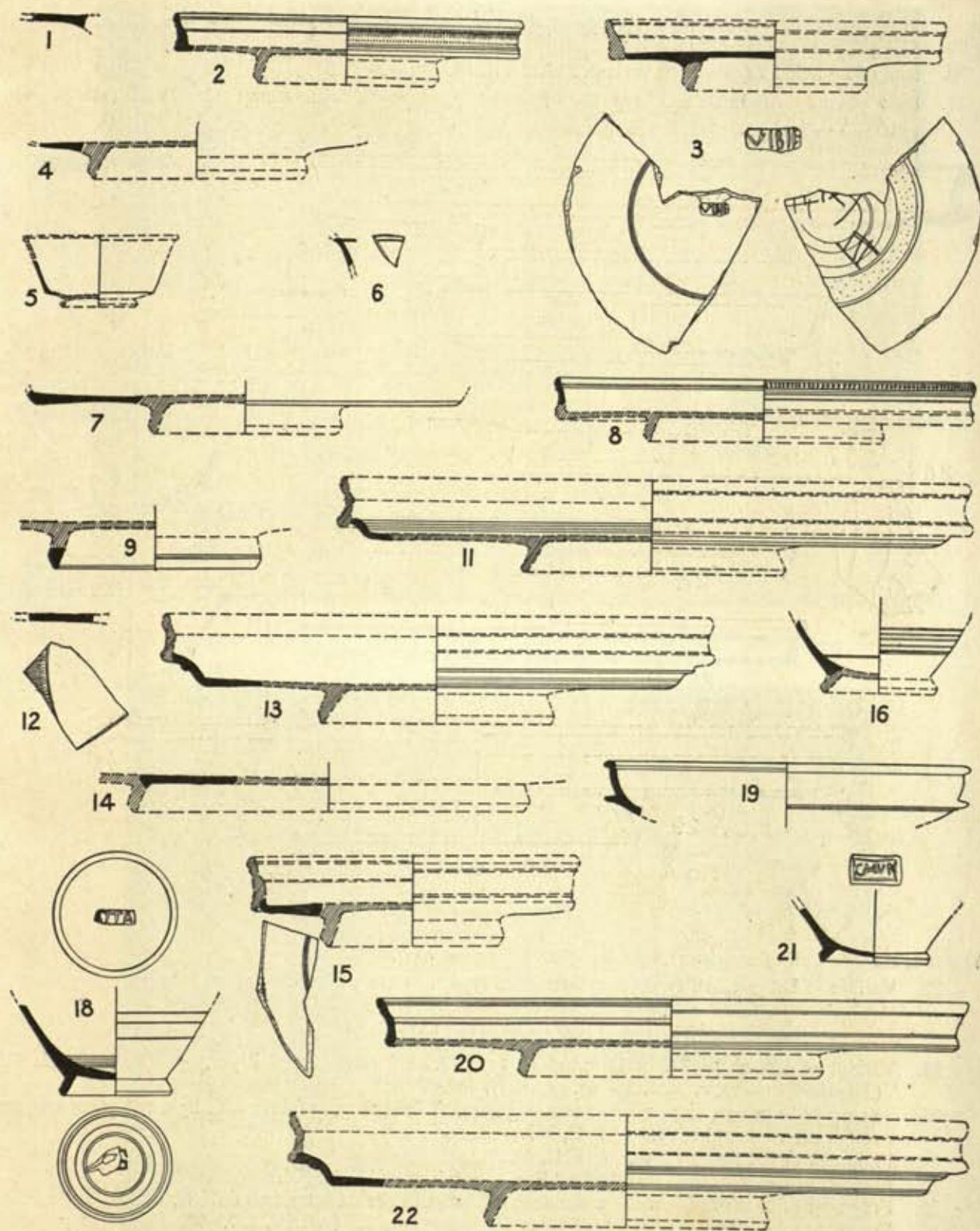


FIG. 5. Arretine pottery from stratified layers, 1945.  $\frac{1}{2}$  (potters' names in 3, 18 and 21,  $\frac{2}{3}$ )



## AK VII

(h) Pit 2A (high up; cf. AK V, Pit 1).

20. Rim of Loeschke type 2A or variant. (AK VII, 14.)

21. Base possibly of Loeschke type 8 or Ritterling type 5, with stamp CAMVRI (see p. 40). (AK VII, 15.)

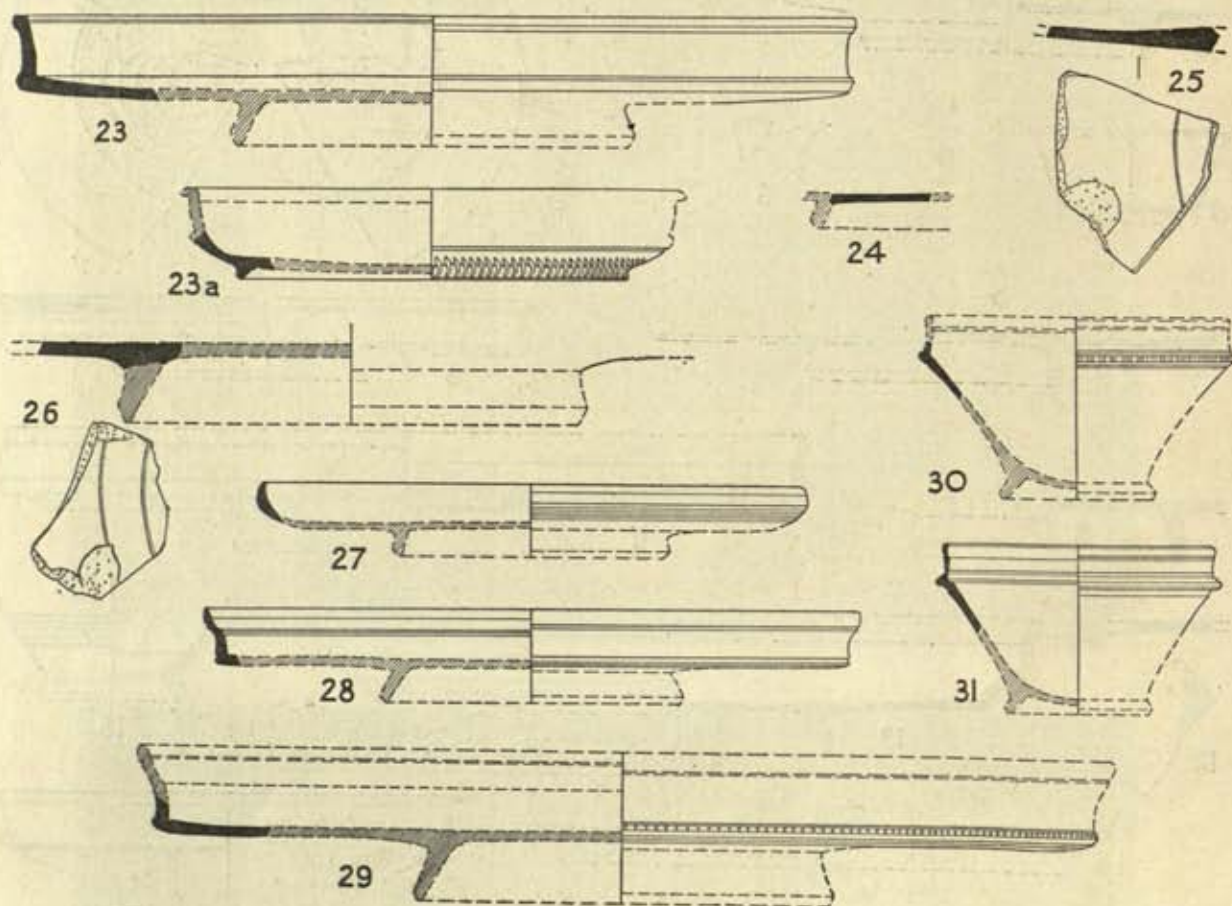


FIG. 6. Arretine pottery from mixed layers, 1945.  $\frac{1}{2}$

## AK VIII

(i) Pit I, cut into wall of warehouse, and therefore subsequent to it.

22. Variant of Dragendorff type 16 or Loeschke type 3. (AK VIII, 49.)

## ARRETINE SHERDS FROM MIXED LAYERS. Fig. 6

23. Variant of Loeschke 2A or Dragendorff type 17. Cf. Oswald and Pryce, op. cit., pl. XLII, 9-11 (Tiberio-Claudian, c. A.D. 25-50). (AK II, 452.)

23a. Sherd of imitation or provincial terra sigillata, of reddish grey fabric with light red glaze and very rough external rouletting. (AK II, 399.)

24. Fragment of flat base of dish. (AK II, 482.)

25. Fragment of base of dish with incised line on interior. (AK II, 503.)

26. Fragment of base of dish with two concentric incised lines on interior. (AK II, 602.)

27. Fragment of rim of Loeschke type 4B or Ritterling type 1. (AK IV, 187.)

28. Rim of Loeschke type 2. (AK X, 2.)





A. AK IV : wall of quadrangle of 'tank B', showing Early and Middle Phase, with chases for timbering

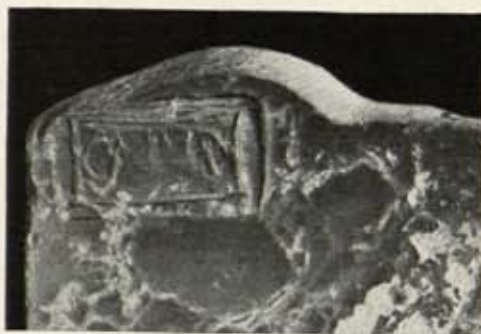


B. Type 1, rouletted ware





A. Arretine stamp *VIBIE* or *VIBIF*



B. Arretine stamp *CAMVRI*

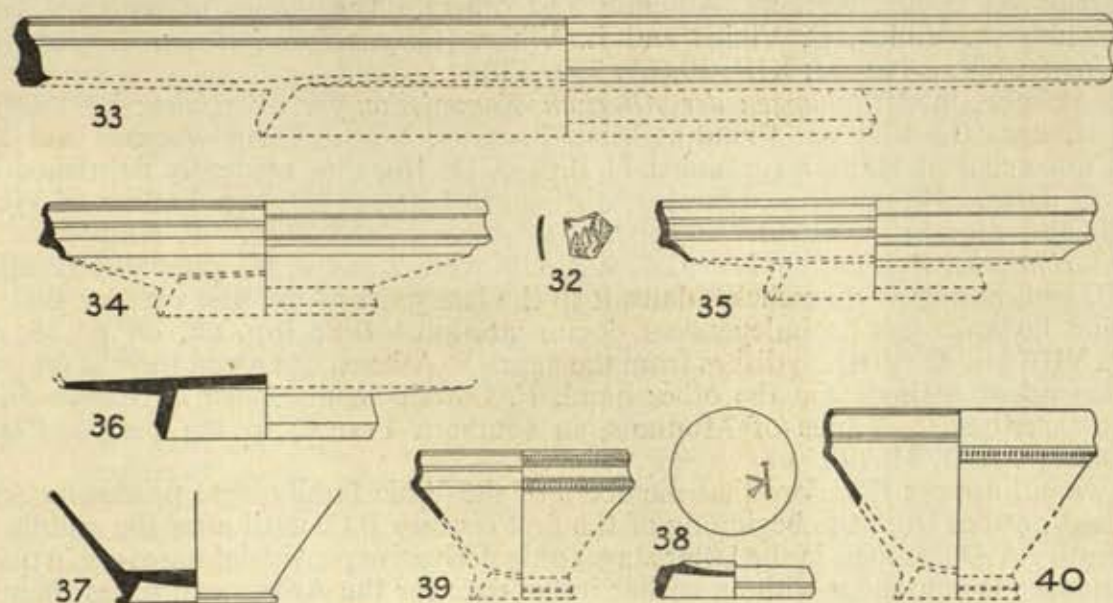


C. Arretine stamp *ITTA*  
Scale 2 : 1



29. Variant of Loeschke type 2. (AK X, 3.)  
 30. Fragment of rouletted rim of Loeschke type 8 or Ritterling type 5. (AK X, 4.)  
 31. Rim of Ritterling type 5. No rouletting. (AK X, 1.)

ARRETINE POTTERY FROM THE PREVIOUS (FRENCH) EXCAVATIONS. Fig. 7

FIG. 7. Arretine pottery from the previous (French) excavations.  $\frac{1}{2}$ 

These sherds are unstratified, but Nos. 37 and 38 are said to have been found at a depth which would equate them with our Arretine-producing layers on AK II.

32. Fragment of fine ware with leaf-pattern impressed from a mould. The sherd is too small to indicate form; possibly Dragendorff type 11. Pl. XXIV, 4.  
 33. Fragment of large dish, Loeschke type 2A.  
 34. Fragment of dish, Loeschke type 3B.  
 35. Ditto. Pl. XXIV, 1.  
 36. Base of dish.  
 37. Base of cup, with indeterminate fragment of potter's stamp.  
 38. Base of cup, probably Loeschke type 8 or Ritterling type 5. On the under side of the base is a graffito K or, more probably, Brāhmī a. Pl. XXIV, 3.  
 39, 40. Cups of Loeschke type 8 or Ritterling type 5. Pl. XXIV, 2, 5.

#### POTTERS' STAMPS ON ARRETINE WARE (pl. XXIII and fig. 5)

1. VIBII—(probably VIBIE, possibly VIBIF). On the interior of the flat base of a dish, form uncertain. Found on Site AK II, layer 7 Ar. There seem to have been two families of Arezzo potters, the Vibii and the Vibieni, to the latter of whom this stamp would appear to belong, but no attempt has been made to distinguish their respective work and date. Miss M. V. Taylor, to whom I have referred the problem, has very kindly spent much time in looking up the appropriate literature at Oxford, and the following is a summary of her report. The first and perhaps best account is by Gamurrini in *Notizie degli Scavi*, 1883, pp. 451ff. He says that the potteries of the Vibieni at Arezzo were near those of M. Perennius and P. Cornelius by S. Maria in Gradi, and worked both before and after them. On the death of C. Vibienus, his sons succeeded to the industry.



What their relation was with the pottery of "Vibius" is not clear, or which employed the other, but the Vibieni and Vibii descended from an ancient Etrurian family, the Vibia, whose name is still preserved in Bibbiena. In any case, north of Arezzo, close to S. Domenico, was the pottery of A(ulus) and C(aius) Vibius who, according to coins found, worked in the second and first centuries B.C. After the death of C. Vibius, the industry was carried on by his workers, Athenius and others. The names of workers with the Vibii include A. Vibius, C. Vibius and L. Vibius (*Corpus Inscriptionum Latinarum*, XI, 6,700, 765ff.; XV, 5,750-60; XIII, 10,009, 290-300).

Loeschcke, in *Mitteilungen der Altertums-Kommission für Westfalen*, V (1909), 186, says that, since the Vibii are found at Mont Beuvray, Neuss, Trion, Vechten and Xanten but do not occur at Haltern (occupied 11 B.C.-A.D. 16), they evidently flourished before the latter dates. He does not, however, distinguish between the two families of Vibii and Vibieni, and most of his evidence appears to relate to the Vibii. T. Knipowitsch, *Die Keramik römischer Zeit aus Olbia* (1929), 9, No. 3, Abb. 2 and p. 12, gives VIBIE (might be VIBIF), and, basing on Loeschcke, dates it to the last years of the first century B.C. The collection however has no independent documentation. Iliffe (op. cit. on p. 35, above) records VIBI and C. VIBI on dishes from the agora at Athens, but again there is (at present) no independent dating. On the other hand, F. Oswald in his *Index of Stamps on Terra Sigillata* ascribes C. Vibius of Montans, in southern France, to the period Claudius-Vespasian (c. A.D. 41-79).

It would appear therefore that members of the Vibia family were producing Arretine or related pottery from the beginning of the first century B.C. until after the middle of the first century A.D., though in the latter stages only derivative provincial wares are in question. The evidence is consistent with an earlier initial date for the Arikamedu series than I have suggested above (p. 22), but is far too confused to be determinate.

2. CÂMVRI. On the interior of the flat base of a cup, probably Loeschcke type 8 or Ritterling type 5. Found on AK VII in Pit 2A, probably contemporary with the 'warehouse'. The stamp is somewhat blurred, but the cross-stroke of the A appears to have been amalgamated with the right instead of the left half of the M.

The stamp of Gaius Amurius occurs on Arretine at Olbia (Knipowitsch, as cited above), at Beisan in Palestine, at Alexandria, and in the Athens agora. See Iliffe, as cited above. In at least three instances it is recorded on dishes of Dragendorff's form 18; this form is characteristic of the last phase of Arretine production, but the date of its introduction is unknown. It occurs also on the dish known as 'Ritterling 5' which is found at Hofheim in the Claudian period (A.D. 41-54).

3. ITTA. On the interior of the flat base of a dish, form uncertain, with an orange-red glaze. Found on AK IV in Pottery Group A which just antedated the earliest, save two, of the brick walls on that site.

Possibly a retrograde stamp of the Augustan potter P. Attius. It is uncertain where he worked (? Puteoli or Arezzo). Iliffe records his stamp from the Athens agora, and it has been found (ATTI) at Mainz on Arretine of Ritterling type 5 in 'marbled' ware (Behn, *Römische Keramik*, Abb. 10, 1; whence Oswald and Pryce, op. cit., pl. XXVIII, 1), and at Haltern (Loeschcke Nos. 117 and 118). His wares were therefore in use within the period 11 B.C.-A.D. 16, the period of the occupation of Haltern.

#### COPIES OF ARRETINE FORMS, AND RELATED WARES (fig. 8)

Close copies of Arretine forms at Arikamedu are restricted to Dragendorff type 24/25, a small bowl with rouletted rim. The copies are of a hard greyish buff ware with polished surface, and differ in fabric sufficiently from the local wares to make it reasonably certain



that they are imports. Two examples were found in the recent excavations, one of them in a layer which also produced Arretine pottery. Other examples, of which two are illustrated (fig. 8, 44-5 and pl. XXIV, 6), were found previously by the French excavators.

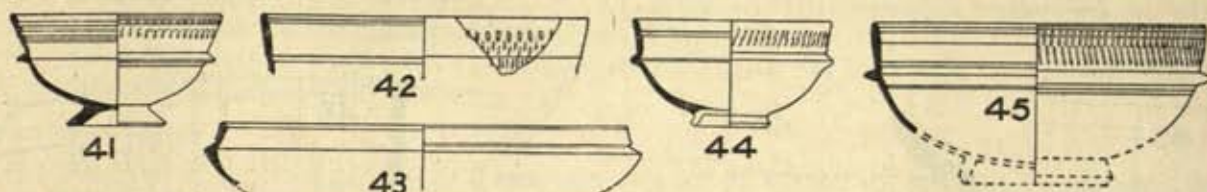


FIG. 8. 41-2 and 44-5, copies of Arretine forms; 43, similar fabric.  $\frac{1}{2}$

Occasional sherds of similar fabric but less distinctive form probably also represent imported wares.

41. From AK II, level 8A, which also produced Arretine sherd No. 15. Copy of Dragendorff type 24/25 (Loeschke type 12 or Ritterling type 6). Rouletted rim. Hard, polished greyish buff ware, grey below. (AK II, 456.)
42. From AK VII, level 3AN, contemporary with 'warehouse'. Fragment of bowl with rim rebated for lid. Not an Arretine form, but of the same foreign fabric as Nos. 44-5. (AK VII, 33.)
43. From a layer immediately overlying No. 42. Fragment of rouletted rim, probably of imitation of Dragendorff type 24. Grey ware, reddish buff surface. (AK VII, 34.)
- 44 and 45. From the French excavations of 1943, said to have been found at '0.60 metres below sea-level', i.e. at approximately the same horizon as the lowest Arretine sherds from the present excavations. Copies of Dragendorff type 24/25. Hard polished greyish buff ware.

### (ii) *Imported amphorae*

Sherds of amphorae of Mediterranean type and fabric were found on all the excavated sites in every significant stratum, with the exception of the lowest (layer 15) on AK II. This layer probably represents the old foreshore, and did not yield much pottery of any kind. The exception is not therefore of importance; and it may fairly be said that, unless for a few superficial and fragmentary walls built of re-used brickbats largely in disturbed soil, the importation of amphorae continued throughout the occupation of the town, as excavated.

The function of the amphorae was doubtless that for which these vessels were commonly used in their lands of origin: namely, to contain wine or oil. Reference has already been made (above, p. 21) to Tamil records of the ancient importation of wine into India from the West, and many of the sherds of amphora from Arikamedu, including the earliest stratigraphically, preserve an internal incrustation which, on analysis, is found to contain resin,<sup>1</sup> a common constituent of Mediterranean wines.

A majority of the sherds is too fragmentary for a reconstruction of the types represented. But a number of them are of a pink fabric with yellow slip which, in Europe, is commonly of a date before rather than after the middle of the first century A.D.; and some of the handles are of the rectilinear and high-shouldered profile to which a similar dating applies. Stratigraphically it would appear that the arrival of amphorae preceded that of Arretine ware (notably on AK II; see above, p. 22), and amphorae continued to be imported or at least used for a considerable time after the introduction of Arretine ware had ceased. Thus on site AK IV, the earliest, save two, of the brick walls overlay a sherd of Arretine (which in turn overlay a stratum containing amphorae), but amphora-sherds are found in *all* strata which can be related to the subsequent structural phases.

<sup>1</sup> Information from the Chemist of the Archaeological Survey of India.



In the course of the 1945 excavations, 116 amphora sherds, representing approximately the same number of vessels, were found. All sherds showing any part of the shape of the vessel are here illustrated (figs. 9 and 10).

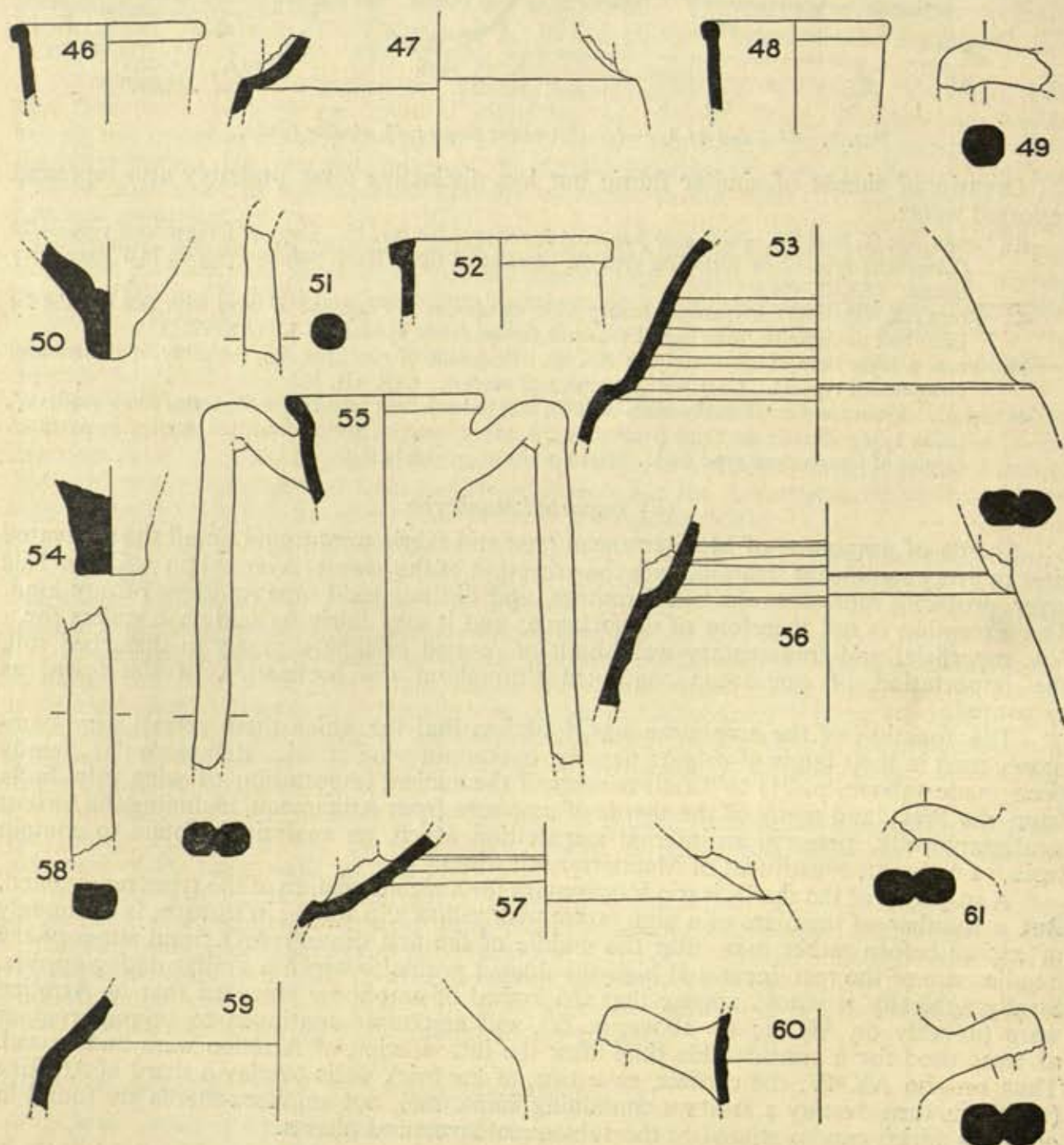


FIG. 9. *Imported amphorae from stratified layers, Northern Sector.*  $\frac{1}{4}$



*(a) Stratified amphorae from the Northern Sector**From pre-Arretine layers:*

46. From AK II, stratum 14 (the lowest save one; 6 feet below present sea-level). Rim of pinkish buff ware.
47. Carinated shoulder, pink ware with yellow slip. From AK V, stratum 11A, underlying the wall of the 'warehouse' and equivalent to strata 13 and 14 on AK II.
48. Rim of yellow-slipped buff ware, same type as No. 46. From AK V, stratum 11, a pre-Arretine layer immediately below present sea-level.

*From Arretine layers:*

49. Fragment of handle of gritty pinkish buff ware from AK II, stratum 8A, which also contained a sherd of Arretine (above, p. 36).
50. Bluntly pointed base, of pink ware with yellow slip, from AK II, stratum 10A, which immediately overlay 8A.
51. Part of straight handle from AK II, stratum 7 Ar., which yielded most of the Arretine sherds from the site. Yellow ware.
52. From AK VIIIA, stratum 7, which equates with the Arretine-producing layer 7 Ar. of AK II. Pinkish buff ware with yellow slip.
53. Angular shoulder from AK VIII, stratum 5, which equates with the Arretine layer 7 Ar. of AK II. Pink ware.

*From post-Arretine layers:*

54. Bluntly pointed base from AK II, stratum 7H, contemporary with the construction of the 'warehouse'. Pink ware, yellow slip.
55. Rim and straight high-shouldered handle, of pink ware. From AK II, stratum 9, immediately overlying 7 Ar. and equivalent to 7H (No. 54). The straight, high-shouldered handle is characteristic of the first half of the first century A.D. (Loeschcke type 66, Ritterling type 73).
56. Angular shoulder, of pink ware with yellow slip. From the same stratum as No. 55.
57. Angular shoulder, pink ware with yellow slip, from AK II, stratum 7A, equivalent to that of Nos. 55 and 56.
58. Straight handle, pinkish ware with yellow slip, from AK II, stratum 7D, make-up of floor of 'warehouse'.
59. Bluntly carinated shoulder, pinkish ware with yellow slip. From AK II, stratum 6, make-up of floor of 'warehouse'.
- 60, 61. Short handles, pink ware with yellow slip, from AK V, Pit 1, subsequent to destruction of 'warehouse'. This stumpy type of handle is contemporary with the tall straight type, No. 55, but also long out-lived it.

*(b) Stratified amphorae from the Southern Sector (AK IV)*

62. Rim, pink ware, from Pottery Group A (with sigillata base stamped ITTA), immediately underlying the earliest-but-one of the brick structures.
63. Angular shoulder, fine pinkish buff ware, dating from the beginning of the main 'Drain Period'.
64. Stumpy handle, pinkish buff ware, from the same layer as No. 63.
65. Fragment of straight handle, from a slightly later structure of the same phase as Nos. 63-4. Pink ware with yellow slip.
66. Pointed base, pink ware with yellow slip. Late 'Drain Period'.
67. Fragment of handle of gritty pink ware. Late Phase.
68. Fragment of handle of fine yellow clay. Late Phase.
69. Fragment of straight handle, gritty pink ware. Late Phase.

*(c) From mixed deposits of the Northern Sector*

70. Fragment of handle, pink ware with yellow slip. (AK II.)
71. Straight handle, pink ware. (AK II.)
72. Rim, buff ware. (AK II.)
73. Part of straight handle, pink ware with buff slip. (AK II.)
74. Rim, pink ware. (AK II.)



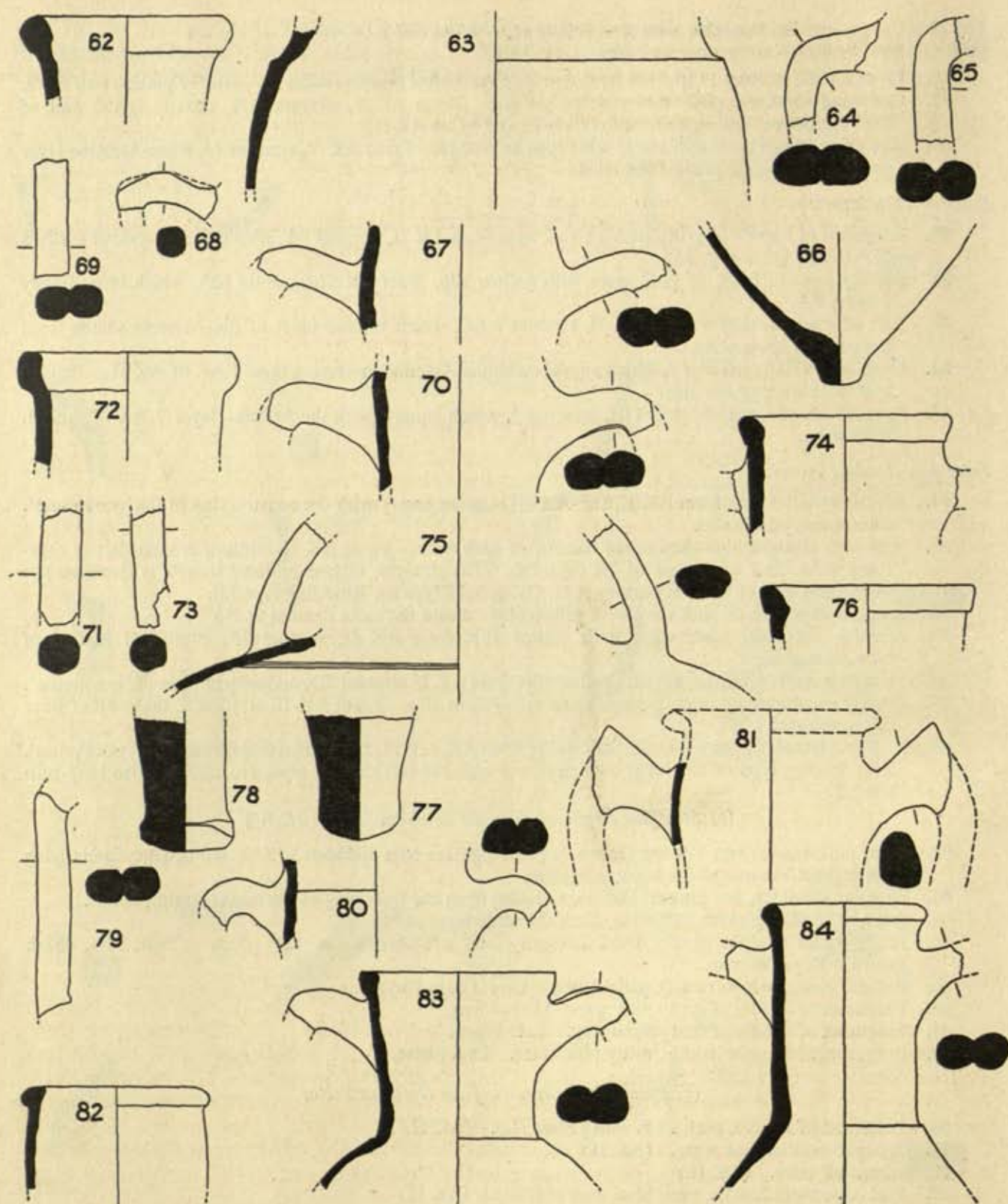


FIG. 10. *Imported amphorae* : 62-69, from stratified layers, Southern Sector ; 70-84, from mixed layers.  $\frac{1}{2}$



75. Curved handle, fine pink ware with yellow slip. (AK VIII.)
76. Rim, pinkish ware with yellow slip. (AK VIII.)
77. Bluntly pointed base, pink ware with yellow slip. (AK VIII.)
78. Bluntly pointed base, pink ware. (AK VIII.)
79. Straight handle, pinkish ware with buff slip. (AK VII.)

(d) *From mixed deposits of the Southern Sector*

80. Fragment of handle, pink ware with yellow slip. (AK IV.)
81. Sharply shouldered handle, fine pinkish ware with yellow slip. This type of handle occurs at Haltern early in the first century A.D. and is found rarely at Hofheim towards the middle of the century. It is exceptional after A.D. 50. (AK IV.)
82. Rim of pink ware, traces of yellow slip. (AK IV.)

(e) *From the previous (French) excavations*

- 83-84. Necks of amphorae of light pink ware, 83 with buff slip.

*Note : an amphora from Taxila*

The only other Indian site known to have yielded an amphora of Mediterranean type is Taxila (Punjab), where an example (fig. 11) was found at a depth of 7 feet 4 inches in the Parthian city of Sirkap, and is dated by Sir John Marshall to the first centuries B.C.-A.D. Now in the Taxila Museum. Unlike the Arikamedu amphorae, which must represent maritime trade, the Taxila example is on general grounds more likely perhaps to have travelled overland from western Asia.

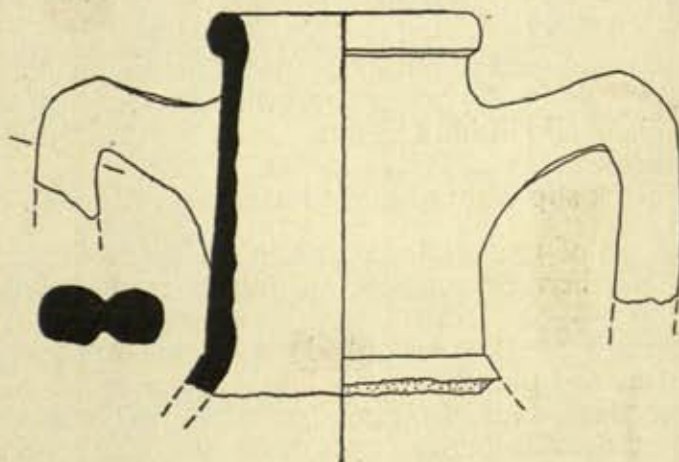


FIG. 11. *Imported amphora from Taxila, Punjab.*  $\frac{1}{2}$

(iii) *Rouletted black ware (Arikamedu Type I)*<sup>1</sup>

A characteristic pottery-type of Arikamedu is a dish (Type 1) sometimes more than 12 inches in diameter, with an incurved and beaked rim which usually has a faceted edge. The ware has a remarkably smooth surface, is thin, brittle and well-burnt, and has an almost metallic ring. The flat interior is normally decorated with two, occasionally three, concentric bands of rouletted pattern (fig. 12 and pls. XXIIB, XXV, XXVI). This pattern is not an Indian feature and may be regarded as an importation from the Mediterranean region, but it has not yet been possible to ascertain whether the type itself is of similar origin. It may

<sup>1</sup> This and the following sections on the pottery are contributed by Mr. Krishna Deva.



in any case be presumed that the varieties with distinctly inferior fabric and degenerate rouletted pattern were manufactured locally.

Sherds of the rouletted black ware are present in all strata of all excavated sites at Arikamedu. Thus on AK II, which is the representative site of the Northern Sector, this ware occurs from the topmost to the lowest stratum, immediately overlying the natural soil, and thus appears to have come into vogue even earlier than the imported amphorae, which are found in all layers save the lowest. With this exception (which may be accidental, see p. 22), the ware is seen to be stratigraphically and chronologically co-extensive with the amphora, though it is found in much greater abundance. It both preceded and outlasted the Arretine ware by an appreciable margin. It is, however, noteworthy that the type is relatively more abundant in the pre-Arretine and Arretine layers of the Northern Sector, which signifies that the type became less popular after the middle of the first century A.D. Similarly, in the Southern Sector (AK IV) it is seen to be commoner in the earlier than in the later deposits. The first appearance of the rouletted pattern at Arikamedu is therefore as early as the end of the first century B.C. or beginning of the first century A.D., the approximate date of the lowest layers of AK II, while its terminal date is determined by the latest occupation in the Southern Sector of the town, attributable to c. A.D. 200.

The ware was carefully potted on a quick wheel from a fine well-levigated clay which burned grey or, more often, greyish pink, the grey colour being due to the reducing condition under which the pot was fired. Before firing, it was usually treated inside and outside with a slip which, on being subjected to an inverted firing, turned black inside and showed variegated shades of grey, black, yellow or brown outside. Occasionally both faces are covered with black slip and rarely with brown. The different shades of the slip occur in the following order of frequency:—

1. Greyish pink ware, grey slip inside, brown to sepia outside.
2. " " " black " " brown outside.
3. Grey ware, black slip inside and out.
4. " " brown " " " "
5. " " black slip with magnetic lustre (below, p. 94).

Of these, the first four are of universal occurrence, while the last is confined to the pre-Arretine layers of the Northern Sector with an overlap in the lowest Arretine-producing layer of AK II.

The interior surface was often burnished while the exterior seldom received this attention. In some cases the polish is high, though inferior to the lustre of the 'black polished pottery' of northern India (*Ancient India*, No. 1, 1946, p. 55). The specimens from the pre-Arretine strata are marked by a generally brighter polish than those from later deposits. The best-finished example of this type, with a remarkably high polish on *both* faces, comes from an early layer of AK V (Northern Sector) immediately underlying the south wall of the 'warehouse' and ascribable to the second quarter of the first century A.D.

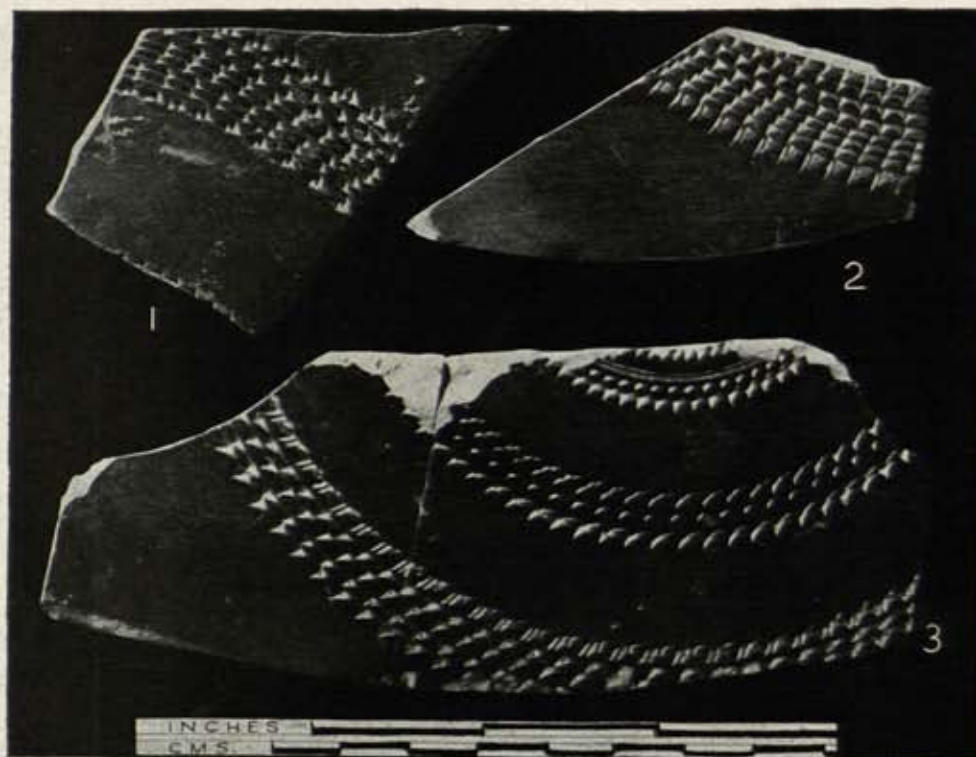
A few varieties of the main type may be distinguished by diversity of shape, fabric and rouletted design (fig. 12). 1a has a more incurved rim and is characteristic of the Early Phase (mid and late first century A.D.) of the Southern Sector, while 1b has the same form as 1a save for the external ribbings, which are absent in the pre-Arretine layers but are of occasional occurrence in later deposits. Variants 1c-d, distinguished by a very pronounced inward projection or beak, are confined to the pre-Arretine layers, although a blunter form, 1e, occurs rarely in these layers and survives occasionally (1f-i) throughout the occupation, associated sometimes with high external grooving. One or two of the latter were shallow bowls rather than dishes and may have lacked the internal rouletting.



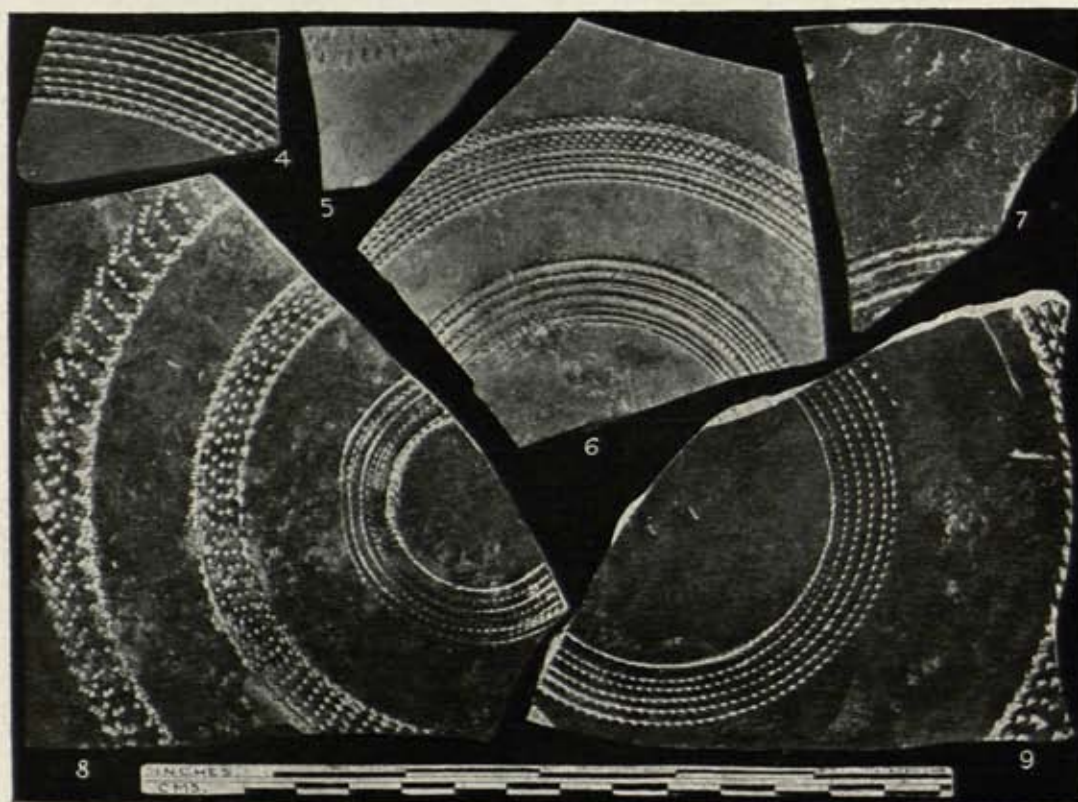


1-5, Arretine pottery; 6, copy of Arretine form.  $\frac{1}{2}$



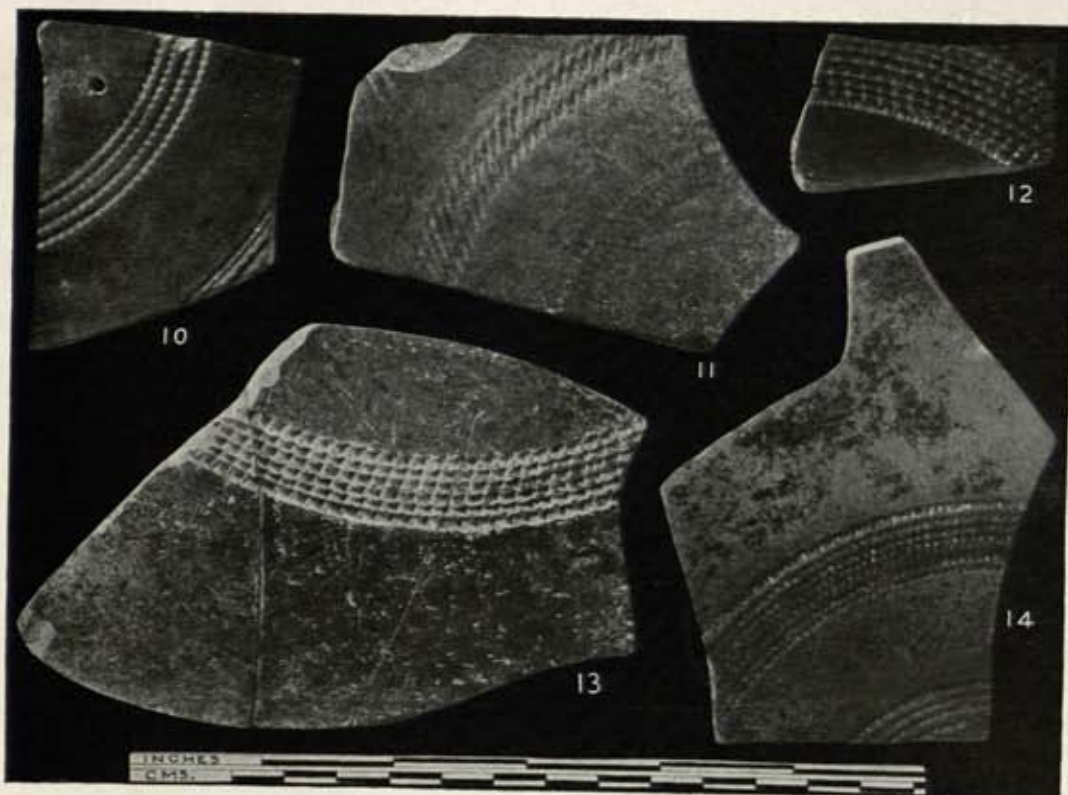


A. Type 1, varieties of rouletting

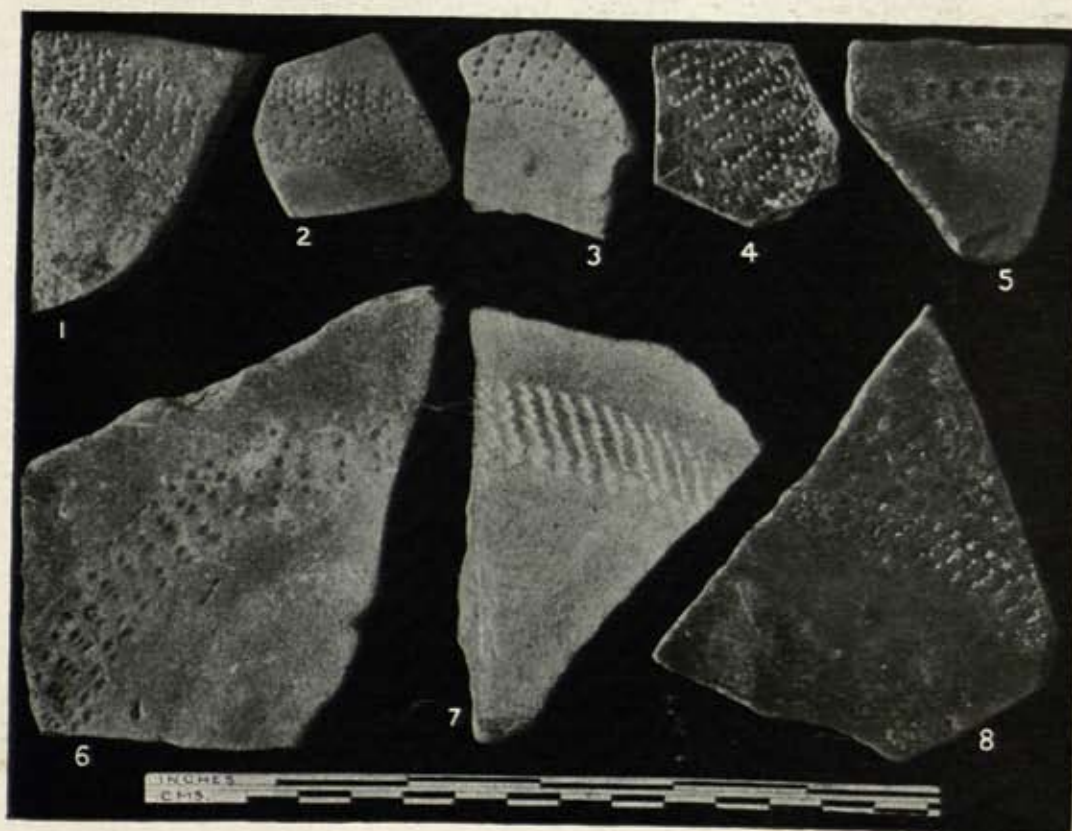


B. Type 1, varieties of rouletting





A. Type 1, varieties of rouletting



B. Type 1, coarse rouletting





A. Rouletted ware : 1, from Chandravalli, Mysore ; 2 and 3, from Amarāvati



B. Base of pre-Arretine pot showing basket-impression



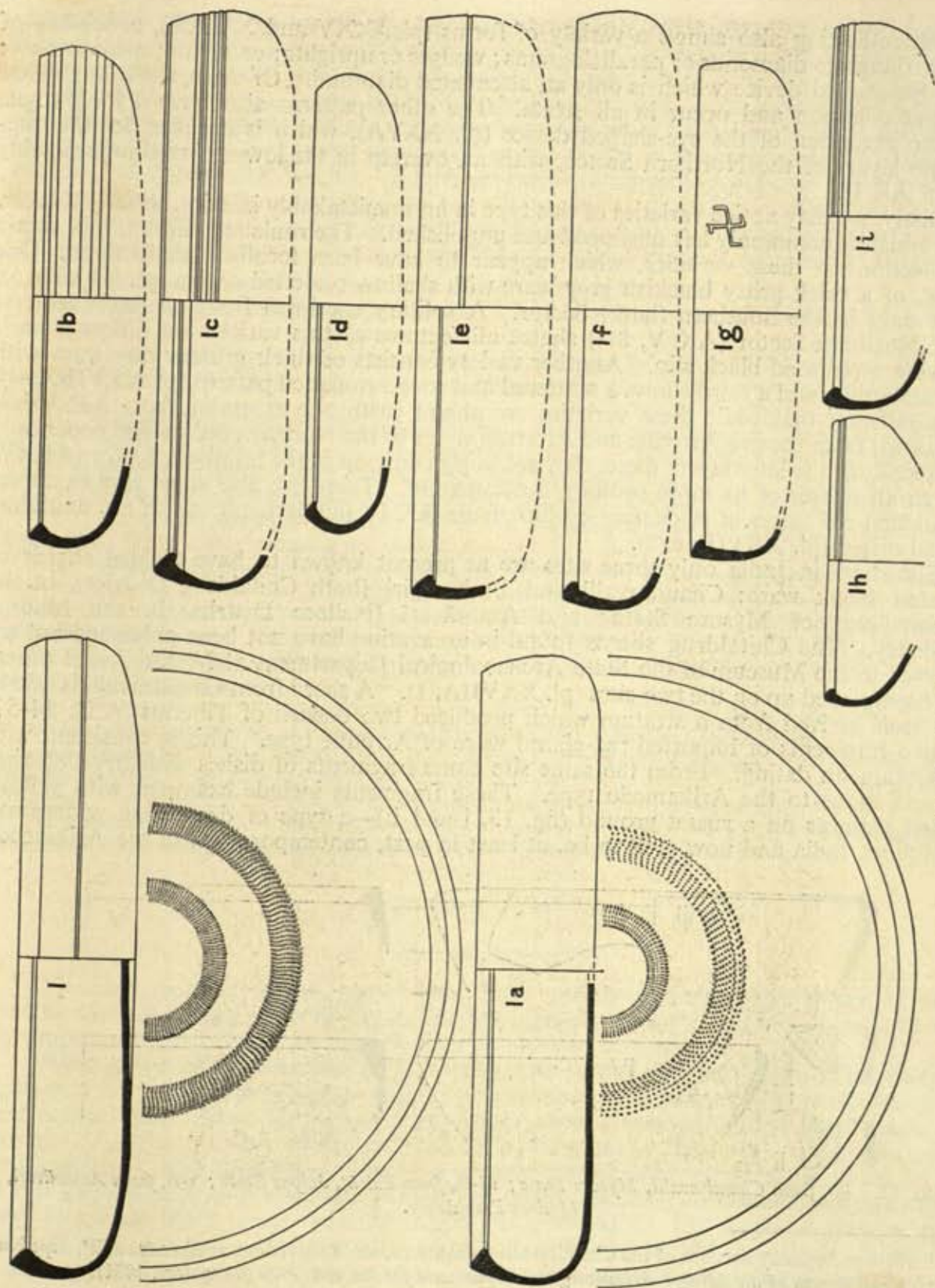


FIG. 12. Type 1, rouletted ware.  $\frac{1}{3}$



The rouletting also shows a variety of forms (pls. XXV and XXVIA), consisting of minute triangles; diamonds or parallelograms; wedges or uprights; crescents; ovals or dots; or an eye-shaped device which is only an attenuated diamond. Of these, the triangles are the most common and occur in all strata. The other patterns also have a long vogue with the exception of the eye-shaped device (pl. XXVA), which is peculiar to the pre-Arretine layers of the Northern Sector, with an overlap in the lowest Arretine-producing layer of AK II.

Lastly, we may notice varieties of this type in an unmistakably inferior, usually thicker, fabric which is commonly left unslipped and unpolished. The rouletted pattern, too, shows deterioration on these varieties, which appear to have been locally manufactured. One variety, of a thick gritty blackish grey ware with shallow rouletted design (pl. XXVIB, 5), occurs only in the Southern (later) Sector. A solitary specimen from an Arretine level of the Northern Sector (AK V, 8N) shares all features of this variety but differs from it in having a polished black slip. Another variety consists of thick gritless grey ware with poor rouletting, and a third shows a scattered and rough rouletted pattern (pl. XXVIB, 2-4). It is significant that while these varieties are absent (with one exception from AK V just mentioned) from the pre-Arretine and Arretine layers of the Northern Sector and occur only sporadically in the later layers there, they are fairly common in the Southern Sector (AK IV) through all phases of its more prolonged occupation. There are also some rare examples of rouletted red wares of thick coarse fabric from AK IV (all periods), which are doubtless of local origin (pl. XXVIB, 6-8).

Elsewhere in India only three sites are at present known to have yielded sherds of rouletted black ware: Chandravalli and Brahmagiri (both Chitaldrug District), in the northern part of Mysore State; and Amarāvati (Nellore District) in the Madras Presidency. The Chitaldrug sherds found in excavation have not been published but are preserved in the Museum of the State Archaeological Department at Mysore,<sup>1</sup> and others have been picked up on the two sites (pl. XXVIIA, 1). A sherd from Chandravalli is said to have been derived from a stratum which produced two denarii of Tiberius (A.D. 14-37) and two fragments of imported red-glazed ware of Arretine type. This is consistent with the Arikamedu dating. From the same site come fragments of dishes with bevelled rims also analogous to the Arikamedu type. These fragments include examples with yellow-painted patterns on a russet ground (fig. 13, i and ii)—a type of decoration widespread in southern India and now seen to be, at least in part, contemporary with the Arikamedu

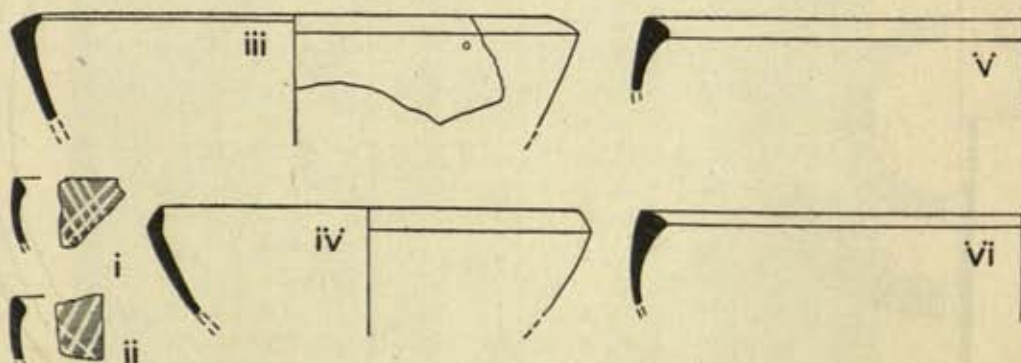


FIG. 13. i-ii, from Chandravalli, Mysore State; iii-iv, from Bairāt, Jaipur State; v-vi, from Amarāvati, Madras Presidency.  $\frac{1}{2}$

<sup>1</sup> For a preliminary account of the Chandravalli excavations, see 'Excavations at Chandravalli', *Supplement to the Annual Report of the Mysore Archaeological Department for the year 1929* (Bangalore, 1931).



occupation. From Amarāvati are derived two sherds of rouletted ware of Arikamedu Type 1, now in the Government Museum, Madras (pl. XXVIA, 2 and 3), and rims of the same type have recently been picked up on the Amarāvati town-site (fig. 13, v and vi).

In North India, in Jaipur State, a fragment of a dish with an inturned beaked rim generally approximating to the Arikamedu type and with a hard grey fabric and polished brown surface, also analogous, was found at Bairāt and is preserved in the Archaeological Museum at Jaipur (fig. 13, iii). The fragment is too small to indicate whether the base was rouletted, and this feature must not be assumed. The rim, unlike the Arikamedu type, is upturned, as is that of a further example of similar ware from Bairāt (fig. 13, iv).

For other resemblances between northern wares and those of Arikamedu, see p. 93.

The following are selected examples of Type 1 and its variants (fig. 12):—

1. Polished grey ware of fine fabric with black slip inside and on outer base, and light brown on outer rim. This is the arch-type. The specimen illustrated has, however, individual features in an inconspicuous external carination near the rim and a groove below, which runs less than half-way round the pot. Like a majority of the type, it bears two rows of fine rouletting. From a pre-Arretine layer (AK V, 11A); early first century A.D.

1a. Polished grey ware with pink patches on exterior and black-slipped interior, and two rings of rouletted pattern. Similar to 1 but with a more pronounced inward curve. From Pottery Group A, Early Phase of AK IV, containing an Arretine sherd stamped ITTA; mid first century A.D.

1b. Similar to 1 but with ribbings on the exterior. From the 'Arretine' horizon, AK V, 8N.

1c. Variety with unusually prominent beaked rim projecting inward, and a series of external grooves. Fabric as 1. From a pre-Arretine layer (AK V, 11A).

1d. Smaller and thinner variety of 1c with a more incurved side. Polished grey ware of fine fabric, greyish blue slip inside and on outer base, and light brown on exterior rim. From a pre-Arretine layer (AK V, 11A).

1e. Rim-fragment of polished greyish brown ware of fine-grained fabric with a blunt but prominent notched beak and external groove. From a pre-Arretine layer (AK II, 14).

1f. Fine grey ware, polished black slip inside and brown outside. From a layer containing Arretine ware (AK II, 11C); first half of first century A.D.

1g. Fine grey ware with pink patches. Shape similar to 1f. Traces of greyish black slip. A *svastika* cut on the outside after firing. From the Late Phase of AK IV; probably second century A.D.

1h. Similar but slightly inferior ware, black internally and brown externally, with blunt beak and high external grooving. This example represents a small bowl rather than a dish, and may not have had internal rouletting. From Pottery Group A on AK IV; approximately mid first century A.D.

1i. Similar ware to 1a. Blunt beak and high external grooving; former presence of internal rouletting uncertain. From Southern Sector, 'Main Drain' Period, first-second century A.D.

## B. LOCAL WARES

### *Introductory note*

Previous sections of this report have dealt mainly with imported wares or motifs. But by far the greater mass of the Arikamedu pottery consisted of local wares, to which the imported material now for the first time gives an approximate chronology.

With a few exceptions, the local pottery was turned on the wheel. The exceptions include a class of portable ovens, rings of 'ring-wells', some large troughs and storage jars, and conical jars of Type 75, the last being partly wheel-turned and partly hand-made. The normal *dégraissants* are sand and grit, but mica and straw or husk are occasionally used for this purpose. The fabric was usually a porous clay containing a fair amount of sand, which burned pink or greyish red to light red under oxidizing conditions of firing and dull grey to greyish black under reducing conditions in the kiln. For a special class of grey or greyish pink wares a superior quality of clay, free from grit and remarkably fine-grained, was employed. Slips are fairly common, and a fair percentage of the pottery was either



salt-glazed (below, p. 93) or treated with a burnished slip. The vast majority of the types are plain and utilitarian in character. Decorated types are rare, and decoration is generally simple and primitive in character, the commonest being finger-tip ornament.

A small percentage of Arikamedu pottery was subjected to inverted firing, i.e. was placed upside-down in the kiln with a fair quantity of carbonaceous matter stuffed inside. As a result of this firing, the whole of the interior and the portion of the exterior (usually the rim) which came into direct contact with the fuel turned jet black, and the remaining outer surface became red under oxidizing conditions and grey under reducing conditions in the kiln. For the sake of brevity we shall refer to the former as black-and-red ware and the latter as black-and-grey ware. The effect was strikingly picturesque if the pots were treated with a slip and salt-glazed (below, p. 93) in course of firing, a feature which is characteristic specially of the 'Arretine' period of the Northern Sector (first half of first century A.D.).

For purposes of classification, the local pottery is divisible into two broad groups, the first coming from the Northern Sector and the second from the Southern. The wares from the earliest layers of the Northern Sector are predominantly grey, with a sprinkling of red wares mostly painted with haematite or bright red slip. In later deposits of this Sector there was a progressive increase in the quantity of red ware, until it assumes parity with the grey and finally outnumbers the latter as the top layers are reached. In the Southern Sector, the occupation of which began later and lasted later, a crude type of pottery overwhelmingly red in colour is predominant. Though many types of the Northern Sector are present here, some new varieties of familiar types and a number of altogether new types are in evidence; whilst the fabric, even in the earliest layers, is generally inferior to that of the Northern Sector, and becomes increasingly degenerate towards the top layers. The conclusion is that the pottery of the Southern Sector represents in the main a continued process of devolution already incipient in the later layers of the Northern Sector. The occasional introduction of new types in the Southern Sector seems to indicate, however, that other influences were at work alongside the normal processes of evolution or devolution.

For the convenience of study, the local pottery and other finds from Arikamedu may be divided into the following chronological classes, corresponding with the stratigraphical evidence:—

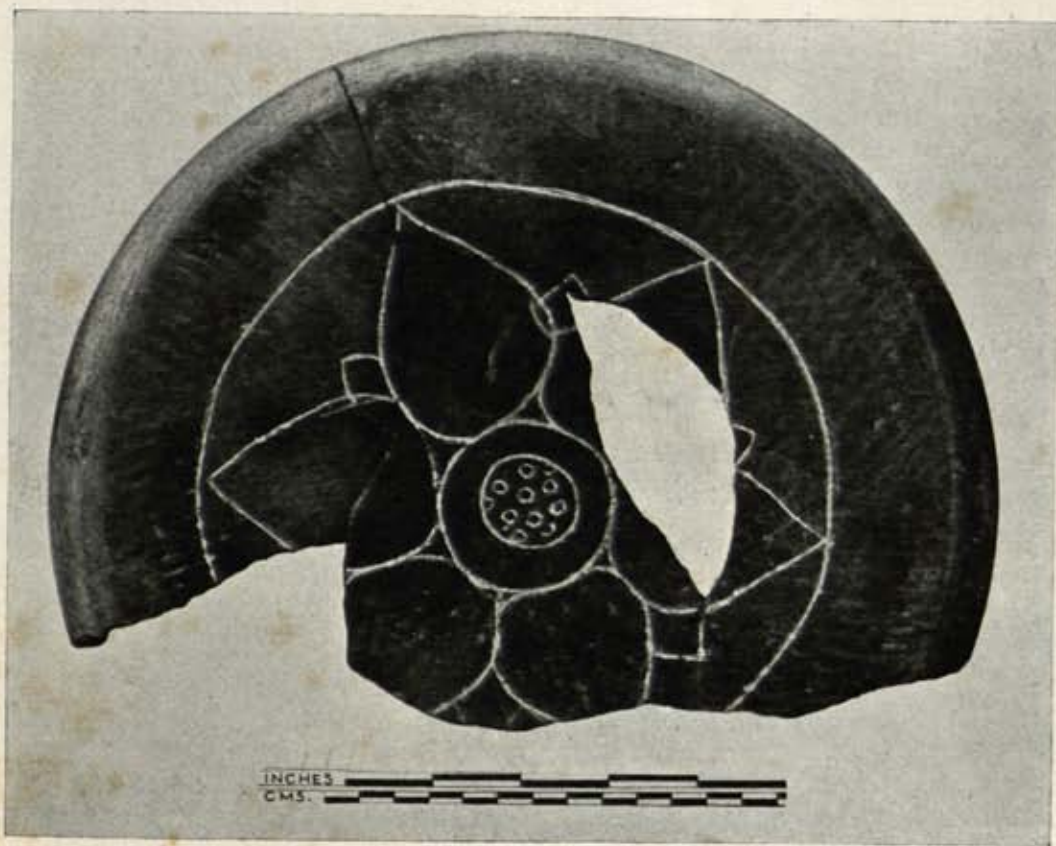
A. *Northern Sector* (first century A.D.):

- (1) 'Pre-Arretine', i.e. finds from the layers underlying those which yielded Arretine pottery and ascribable to the end of the first century B.C. or the beginning of the first century A.D. ;
- (2) 'Arretine', i.e. finds from the layers yielding Arretine pottery, and other equivalent layers of the first half of the first century A.D. (mainly c. A.D. 20-50) ;
- (3) 'Post-Arretine', i.e. finds from all the upper layers, which in the absence of any significant sub-division will be dealt with together. They are of the mid or late first century A.D.

B. *Southern Sector*, mostly AK IV (mid first-second century A.D.):

- (1) 'Pre-structural', shortly before the middle of the first century A.D. ;
- (2) 'Early Phase', mid or late first century A.D. ;
- (3) 'Main Drain Period', i.e. finds contemporary with the elaborate system of drains and connected walls of Middle Phase, sub-period 1; first-second century A.D. ;
- (4) 'Late Drain Period', i.e. finds contemporary with the additions and restorations to the main drain and other connected walls of Middle Phase, sub-periods 2 and 3; second century A.D. ;



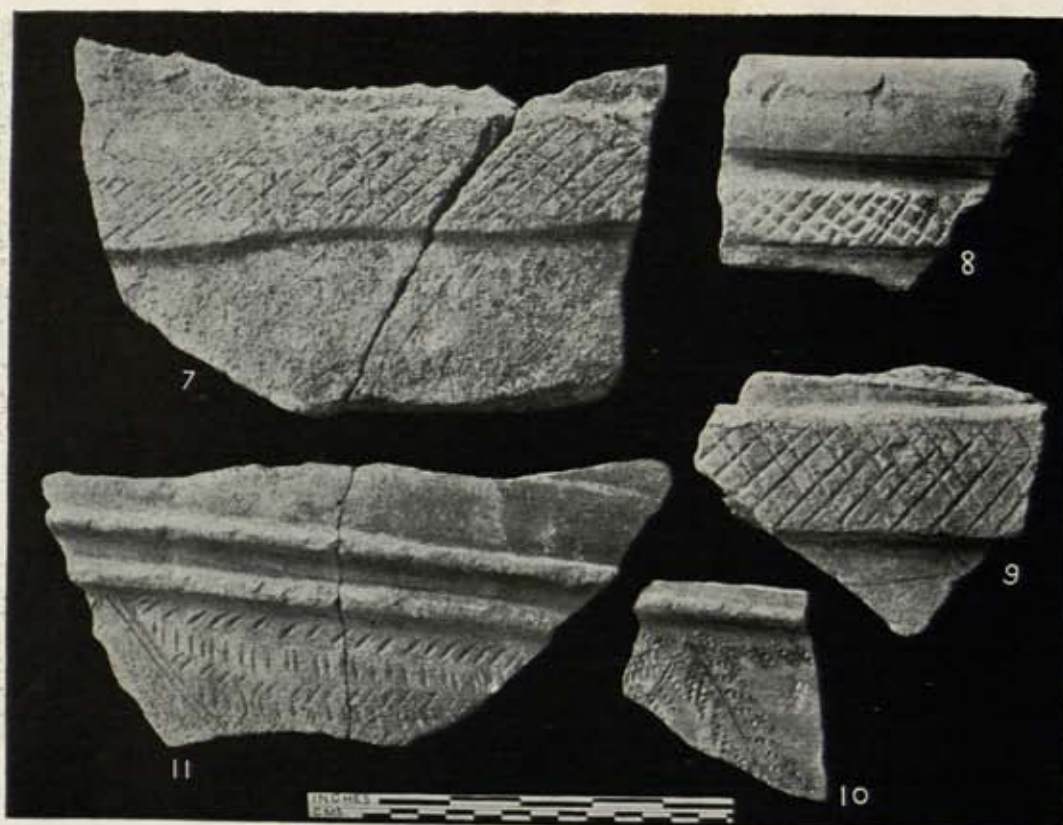


A. Type 6, base showing basket-impression and graffito decoration



B. Decorated sherds from pre-Arretine layers





A. Decorated sherds from pre-Arretine layers



B. Decorated sherd from pre-Arretine layers





A. Decorated sherds from Arretine layers

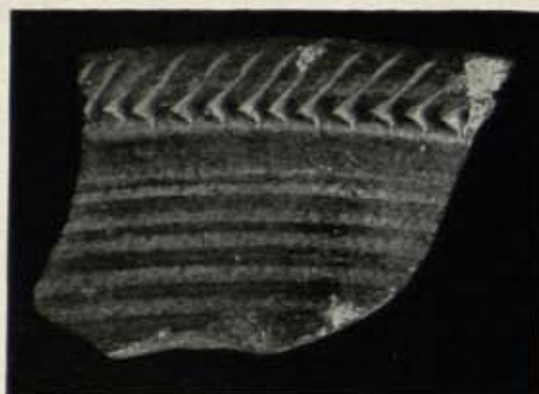


B. Decorated sherds from Southern Sector, Pre-structural Phase

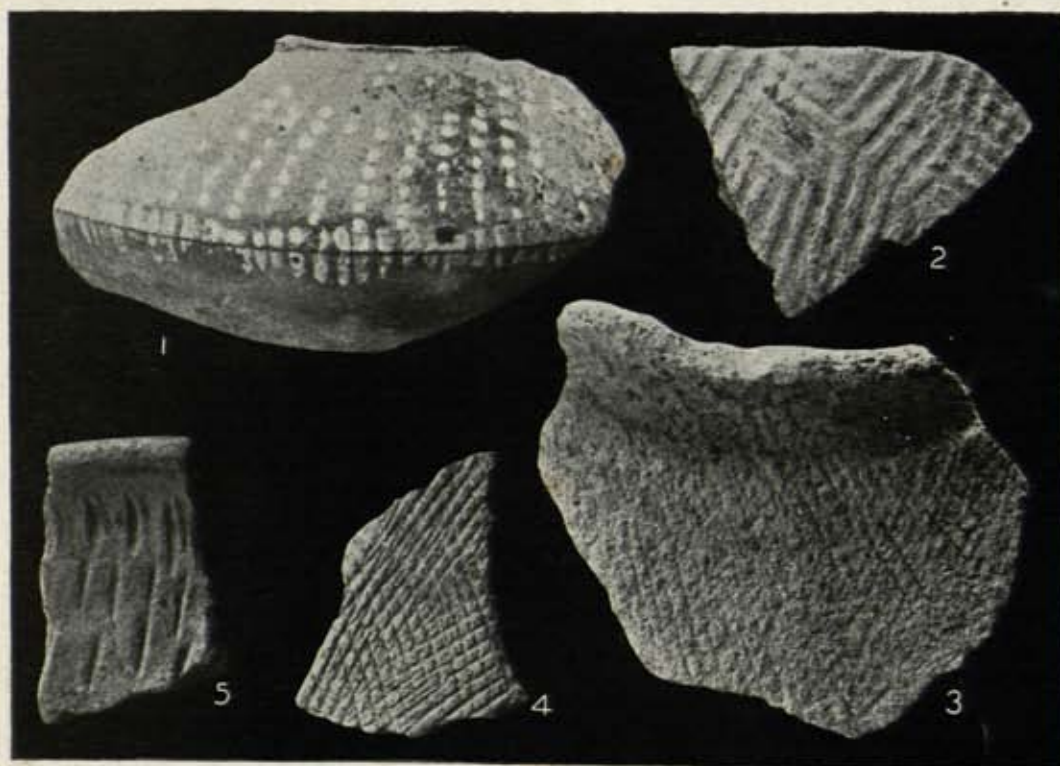




A. Graffito ; Southern Sector,  
Middle Phase.  $\frac{1}{1}$

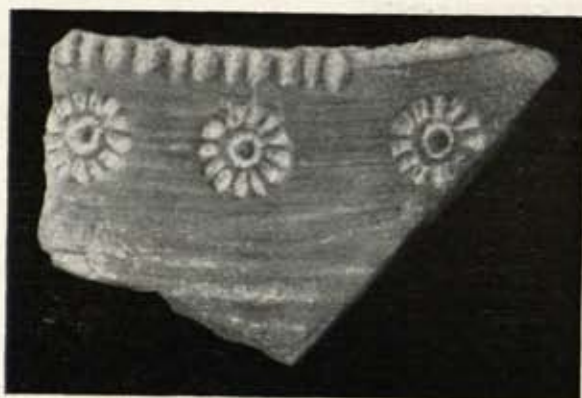


B. Pre-Arretine sherd,  
Northern Sector.  $\frac{1}{1}$



C. Painted and incised sherds ; Southern Sector, Early Phase.  $\frac{1}{1}$





A. *Post-Arretine sherd ; Northern Sector.*  $\frac{1}{1}$



B. *Decorated sherds ; Southern Sector, Late Drain Phase*







- (5) 'Late Phase', i.e. finds belonging to a period when the earlier structures were entirely discarded and their place was taken by a few isolated and fragmentary walls here and there; second century A.D., or later.

A(1). *Pre-Arretine (late first century B.C. or early first century A.D.)*.—The pre-Arretine or earliest group of pottery from Arikamedu comes from the lowest layers of the Northern Sector which are now submerged from 2 feet to 10 feet below mean sea-level. The pottery from the following layers are included in this group:—

- AK II { layer 12 (underlying the lowest Arretine layer).  
 (A-P) { " 13  
 " 14  
 " 15 (overlying the natural soil).  
 AK II (I-X)—layer 12.  
 AK V { layer 9N = 11.  
 " 10N = 11A. (These layers are equivalent respectively to 13 and 14 of AK II.)

The pottery from these early layers is predominantly grey and of a coarse to medium fabric, usually treated with a greyish chalky slip which is not infrequently polished or salt-glazed. The only exception occurs in the lowest layer of AK II which has yielded more red than grey ware, but, as little pottery of any kind was found in this layer, which presumably represents the old foreshore, the exception cannot be stressed.

The distinctive feature of this group is the occasional use of a bluish chalky slip, which is absent on pottery from later deposits. It occurs on a fair number of common grey-ware pots belonging to Types 3, 4, 8, 9, 11, 21, 24, 28, 30, 31, 43, 48, 59, 74, 93 and 101. Analysis shows that the chalky matter consists of an aqueous suspension of kaolin, while the bluish shade is due to traces of ferrous oxide.<sup>1</sup>

Salt-glazed bowls of Types 9, 9d and 9h-m of a polished black-and-grey fabric are also characteristic of this group. Another feature peculiar to it is a black slip with magnetic lustre (magnetic oxide of iron) which occurs occasionally on Types 1, 2 and 9 (below, p. 94). A majority of the characteristic types of Arikamedu are already present in this group. These include Types 1-4, 8-12, 21, 22, 24, 25, 28, 30, 31, 34, 42-45, 48, 54, 55, 59, 60, 70, 72, 74-76, 82-84, 87-88, 93, 97 and 101.

Ornamentation is rare on the pre-Arretine wares and comprises, besides finger-tip ornament, simple incised and applied designs and patterns impressed deliberately or accidentally from mats or baskets (pls. XXVIII B and XXVIII B, 4-5). A black-and-red ware dish of Type 6 is remarkable for the mat-impressions on its exterior base, which is further embellished with a lotus design incised after baking (fig. 15, Type 6; pl. XXVIII A). Other devices are: a row of oblique wedge-shaped slashes on a fragmentary vessel of buff ware (pl. XXXI B); incised herring-bone patterns on a number of storage jars (pl. XXIX A, 1-2; 10-11); incised zig-zags on the neck of a basin (pl. XXVIII B, 3); raised bands with cross-hatched pattern on storage jars and basins (fig. 30, Types 83 and 83b; pl. XXIX A, 7-9); and indentations within incised horizontal and vertical grooves (pl. XXIX B).

A(2). *Contemporary with Arretine (c. A.D. 20-50)*.—The pottery contemporary with the Arretine wares is distinguished from the pre-Arretine groups by the absence of the markedly bluish chalky slip, the only exceptions occurring occasionally in the lowest Arretine-producing layer (AK II, 8 green), which yielded eleven sherds with this slip. Of these, six belong to Type 9, four to Type 8 and one to Type 9h as against fifteen, thirty-four and nil respectively with other varieties of slip from the same stratum. Other overlaps from the previous groups consist of two examples of black slip with magnetic lustre (below, p. 94) and two fragments of polished black-and-grey ware bowls of Type 9h. These overlaps confirm the general continuity of culture on the site.

The pottery of the Arretine phase, like that of the pre-Arretine, is predominantly of a coarse grey fabric and is usually treated with greyish (not bluish) chalky slip which is often salt-glazed (below, p. 93) or polished. A trend is, however, noticeable towards a gradual increase in the frequency of red ware throughout the phase, until we find the red and grey ware in approximately equal quantities in the latest Arretine-producing strata.

Many types survived from the preceding period into this, but some new forms such as Types 18, 18a, 49, 61, 69 and 73 were introduced now for the first time.

Mottled ware is also peculiar to this group. A small number of slipped and salt-glazed pots of Types 4, 8 and 24 exhibit patches of pink colour variegated with greenish grey, with striking effect. On a dish of Type 8

<sup>1</sup> Information from the Chemist, Archaeological Survey of India.



occurs an irregular scaly design in greenish line on a background of salt-glazed chalky slip. It is, however, difficult to ascertain whether the mottling was merely accidental or deliberate.

Black (as distinct from dark grey) ware is represented in this period by half-a-dozen specimens belonging to Types 8, 9 and 43, as against a solitary example in the pre-Arretine group.

Ornamented pottery is even rarer in the Arretine phase than in the pre-Arretine. Of painted decoration there is a single fragmentary specimen, too minute for illustration, showing faint bands in black on a light red ground. Of incised ornament, the most noteworthy is the *svastika* scratched after baking on two fragmentary bowls of Type 9 (pl. XXXA, 2-3). A variety of basket-impression is an innovation of this period (pl. XXX, 1). All other patterns are survivals from the preceding phase.

A(3). *Post-Arretine (second half of first century A.D.)*.—In the post-Arretine period of the Northern Sector the principal types and fabrics remained substantially the same as in the preceding periods. The only difference occurs in the relative incidence of the red and grey wares, of which the former now becomes predominant, thus indicating a change in technique. The muffled kiln, or firing under reducing conditions, appears to have lost favour with the potter of the post-Arretine period, who developed a growing fondness for the open kiln or firing under oxidizing conditions.

Another change in this period consisted of a diminution of the vogue for burnishing and salt-glazing.

Such utilitarian devices as spouts and handles are now in greater evidence, though they are still far from common. Spouts and lug-handles, of which there are two varieties, are innovations of this period, and are continued in the Southern Sector.

New forms introduced in this period were Types 5, 8*q*, 8*x-w*, 9*f-g*, 29, 32, 33, 38, 41, 53, 71, 78, 80*a*, 113 and 116.

Some of the old types undergo a slight modification in this period or produce new varieties. Thus we get, besides the normal form, a thicker variety of Type 9*w* in red ware with a roughly finished surface on which no care has been taken to obliterate the corrugations produced by the wheel. This new variety continues in the Southern Sector and gets progressively more degenerate there. Further, a highly burnished variety of Type 4, with a distinct ware and fabric, is peculiar to this period.

Haematite slip is rare in this as in the Arretine class and occurs only on a few sherds of Types 9*h-i* and 42.

Most of the decorative motifs of the preceding periods survived in this phase. The only innovation is a stamped design of rosettes occurring on a red-ware fragment (pl. XXXIIA).

B(1)–(5). *Pottery from the Southern Sector (late first-second century A.D.)*.—The two sites excavated in the Southern Sector, AK I and IV, both showed extensive disturbance at the hands of brick-robbers, and only AK IV produced significant layers (above, p. 26).

This Sector represents an essentially red-ware culture which contrasts with the grey-ware culture of the Northern Sector. As we have seen (p. 50), the transition from grey to red ware was achieved by slow stages, which were all traversed in the Northern Sector, so that the monopoly of red ware in the Southern Sector does not indicate a cultural intrusion there. The essential continuity of the two Sectors is corroborated by the survival of most of the characteristic types of the Northern into this Sector. In the latter the pottery tends to degenerate in course of time, becoming progressively coarser and more devoid of slip in the upper levels. The retrograde tendency is noticeable as early as the Early Phase and becomes a regular feature of the later wares from the Late Drain Period onwards.

Towards the close of sub-period 1 of the Early Phase a large heap of pottery was dumped in a sealed pit and is called 'Pottery Group A'. This Group contained an Arretine bowl stamped ITTA (above, p. 40), half-a-dozen pieces of imported amphora, the base of a pot bearing a Prākṛit graffito, and a large number of familiar types with variants.

Ornamentation is as scarce in this Sector as in the Northern, and is indistinguishable from it. From the Pre-structural Phase of this Sector, three sherds bear incised criss-cross patterns (pl. XXXB, 2-4); two are decorated with oblique slashes (pl. XXXB, 5); the base of a grey-ware bowl is stamped on the interior with a row of lotus petals comparable with those on fig. 36, Type 141 (pl. XXXB, 1); while a rouletted sherd (Type 1) bears a graffito of lotus stalks (pl. XXXB, 6). From the Early Phase comes a small carinated vessel of thin fabric, decorated with slanting rows of dots in white paint on a red-slipped surface (pl. XXXIC, 1). Another sherd, of Type 8, bears deep slashes on the interior (pl. XXXIC, 5). Mat-impressions are still frequent (pl. XXXIC, 2-4).

To the Main Drain Period belongs a sherd bearing a graffito of a double *svastika* (pl. XXXIA).

The decorated sherds from the Late Drain Phase include a fine grey-ware bowl stamped on the interior of the base with conventional lotus petals similar to Type 141 (fig. 36, pl. XXXIIB, 3); a jar-fragment bearing incised palm-leaf pattern (pl. XXXIIB, 1) and a sherd with criss-cross pattern (pl. XXXIIB, 2).



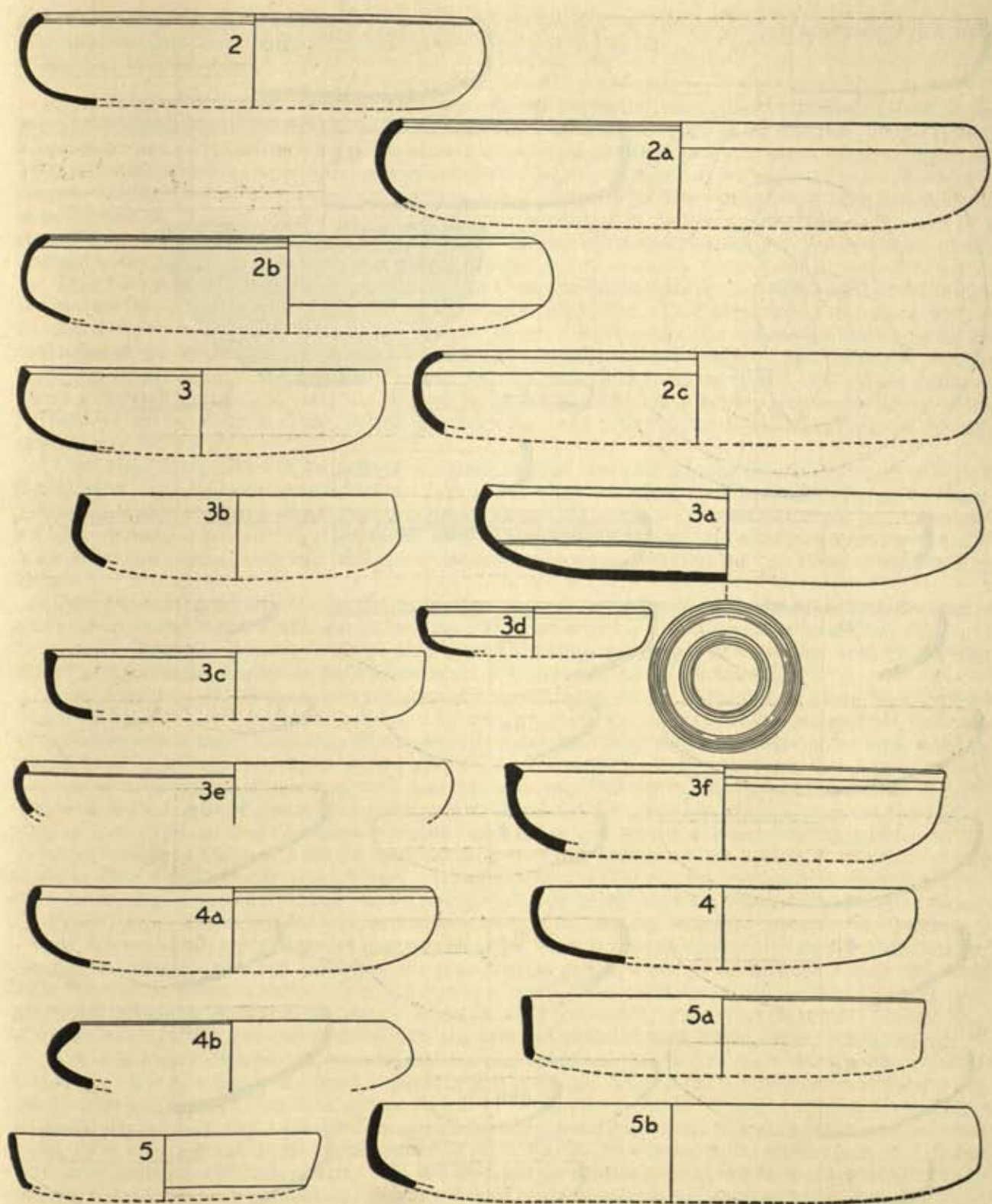


FIG. 14. Types 2-5.  $\frac{1}{4}$



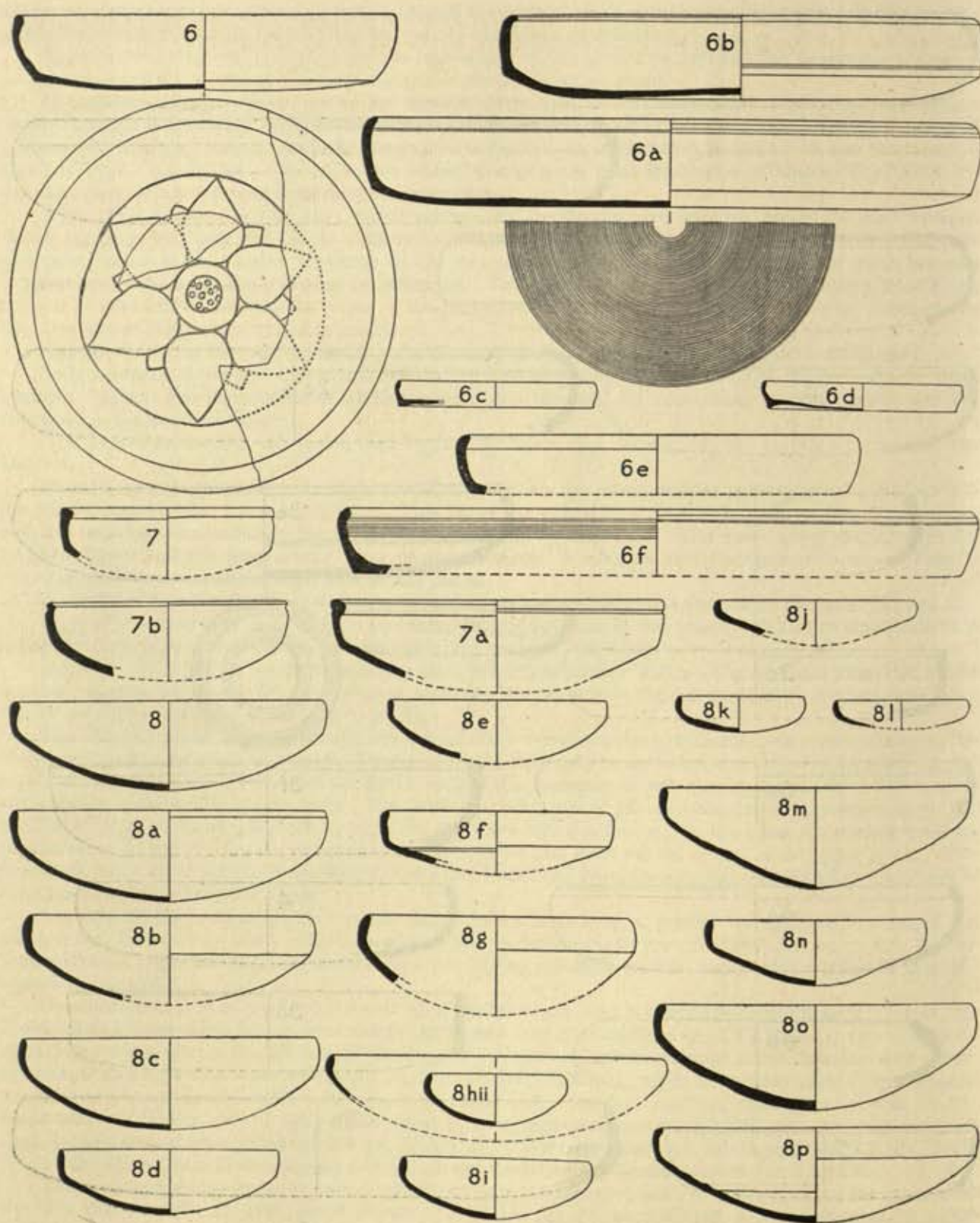


FIG. 15. Types 6-8.  $\frac{1}{4}$



It may be added that a number of superficial and disturbed layers yielded sherds of Chinese celadon ware, evidently deposited during the spoliation of the site in the middle ages (below, p. 91).

#### Types 2-148

Type 2 is a dish identical in fabric with Type 1 (p. 46) but lacking the inward projection or beak at the rim. Like Type 1, it has a sharply incurved side and the lip is usually faceted at the edge, but, unlike Type 1, it constitutes one of the minor types of the site. The arch-type and the variant 2a with a slightly thicker rim are occasionally found throughout the occupation of both Sectors, though they are relatively more abundant in the pre-Arretine and Arretine layers of the Northern Sector. Variant 2b, with a thinner and more pronouncedly incurved side and a larger number of facets at the rim, is peculiar to the pre-Arretine layers. Though of a markedly coarser fabric, variant 2c shares all the other features of the type, including its polished surface; it is confined to the post-Arretine strata of the Northern Sector.

Type 3 is a dish with a beaked rim similar to Type 1 but, like the majority of the local types, is of an inferior and coarser fabric; also it is invariably devoid of rouletted decoration. This is another of the minor types of the site, though it is found in all periods of the two Sectors. Variant 3a deviates from the main type in the decoration of the inside of the base with rows of roughly incised concentric circles. This feature is peculiar to the pre-Arretine and Arretine layers. Variant 3b, with an almost carinated profile, is a unique specimen from an Arretine stratum (AK VIII, 5). Variants 3c, 3d and 3f, which are invariably grey wares, belong to the pre-Arretine strata; while 3e occurs occasionally from the pre-Arretine period to the Late Phase of AK IV, exclusively in red ware.

Type 4 is a simple dish with an incurved rim and a rounded base and, amongst dish-forms, is next to Type 1 in frequency. This type is of similar fabric to Type 3, and occurs in a variety of colours such as grey, red, black-and-red, or black-and-grey, due to differential firing. Variant 4a, having an internally clubbed rim, is a unique pot from a mixed group (AK VIII, pit 1), while 4b with a sharply incurved side is remarkable as much for its shape as for its whitish fabric. Only two examples of the latter are known, both from the Late Phase of the Southern Sector.

Type 5 is a carinated dish with an almost straight side and is of the same coarse fabric as Type 3. This is a very rare type and does not occur earlier than the post-Arretine period in the Northern Sector and the Early Phase in the Southern. Variant 5a differs from Type 5 in having a slightly concave profile, while 5b is a dish of finer grey fabric peculiar to the Early Phase of AK IV, including Pottery Group A.

Type 6 is a rare dish with an incurved rim and flattened sagger base. The arch-type comes from the pre-Arretine layers and is only found in black-and-red ware of coarse fabric. The specimen illustrated has, however, individual features in being decorated with mat-impressions (pl. XXVIII A) over the exterior of the base, which is embellished with a large lotus flower incised after baking. Variants 6a-b are grey wares occurring exclusively in the pre-Arretine layers and are even rarer than the main type. Variant 6a, with a lip thinner than the arch-type, is incised with numerous concentric grooves on the interior of the base, while 6b is distinguished by a slightly concave base. Variants 6c-d are unique miniature dishes of fine grey ware (the former from 'Pottery Group A', i.e. Early Phase, and the latter from the Main Drain Phase of the Southern Sector), which have similar profile as 6a but show a pronouncedly concave base. Variants 6e-f are thicker grey-ware dishes of fine-grained fabric, and occur at all periods in the Northern Sector and in the Pre-structural and Early Phases of the Southern Sector.

Type 7, a dish with a rounded base, is distinguished by a clubbed and externally grooved rim. Variant 7a is larger in size and has a deeper groove than the main type, while 7b has a smaller rim and more rounded profile. The type is extremely rare and belongs to the post-Arretine period, while its variants come from the Main Drain Phase of the Southern Sector. The arch-type is of coarse greyish buff ware, black inside and on outer rim, and greyish buff on the exterior of the base. Variant 7a is of black-and-red ware of coarse fabric. Variant 7b is of greyish buff ware of a fine-grained fabric with grey core and smoothed buff-slipped surface inside and out.

Type 8 is a dish distinguished by a sagger base and constitutes one of the most characteristic types of Arikamedu. It is of a coarse fabric and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern and all periods of the Southern Sector. Some of the grey examples are salt-glazed (see below, p. 93). Though it was primarily a dish, some pots of this type may also have been used as lids. The arch-type and all its variants save 8f-g, 8j, 8l and 8q-z are found in abundance from the earliest to the latest occupation of both Sectors. Variants 8a-e and the miniature variety 8k have a similar base to the arch-type but differ from it in rim-form. Variants 8f and 8l are peculiar to the Arretine layers of the Northern Sector, while 8g and 8j are confined to the pre-Arretine layers. Variants 8h-i form a class by themselves by reason of their distinctive sharpened rim-form. Similarly variants 8m-p constitute a homogeneous group in



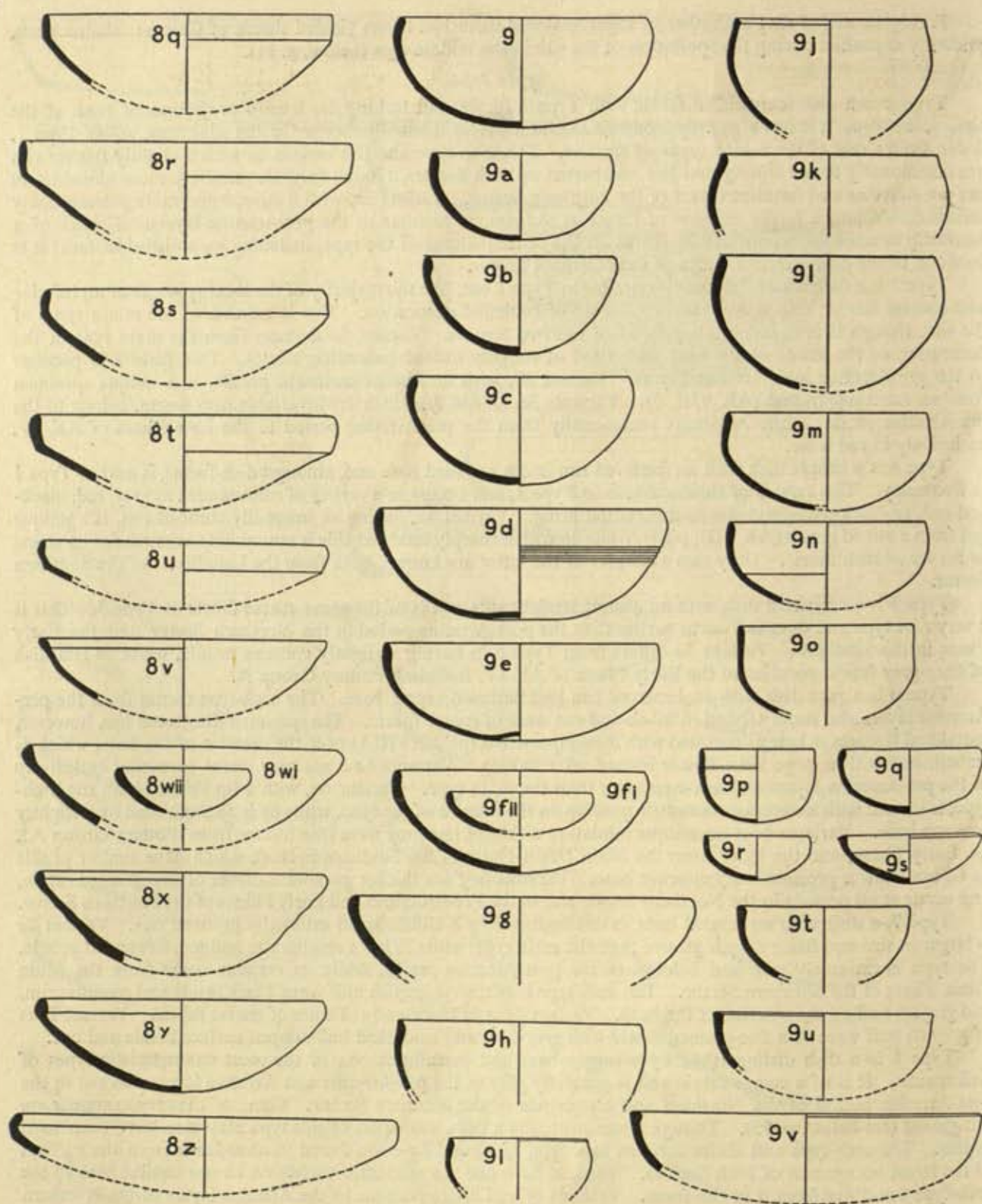


FIG. 16. Types 8 (continued)-9.  $\frac{1}{4}$



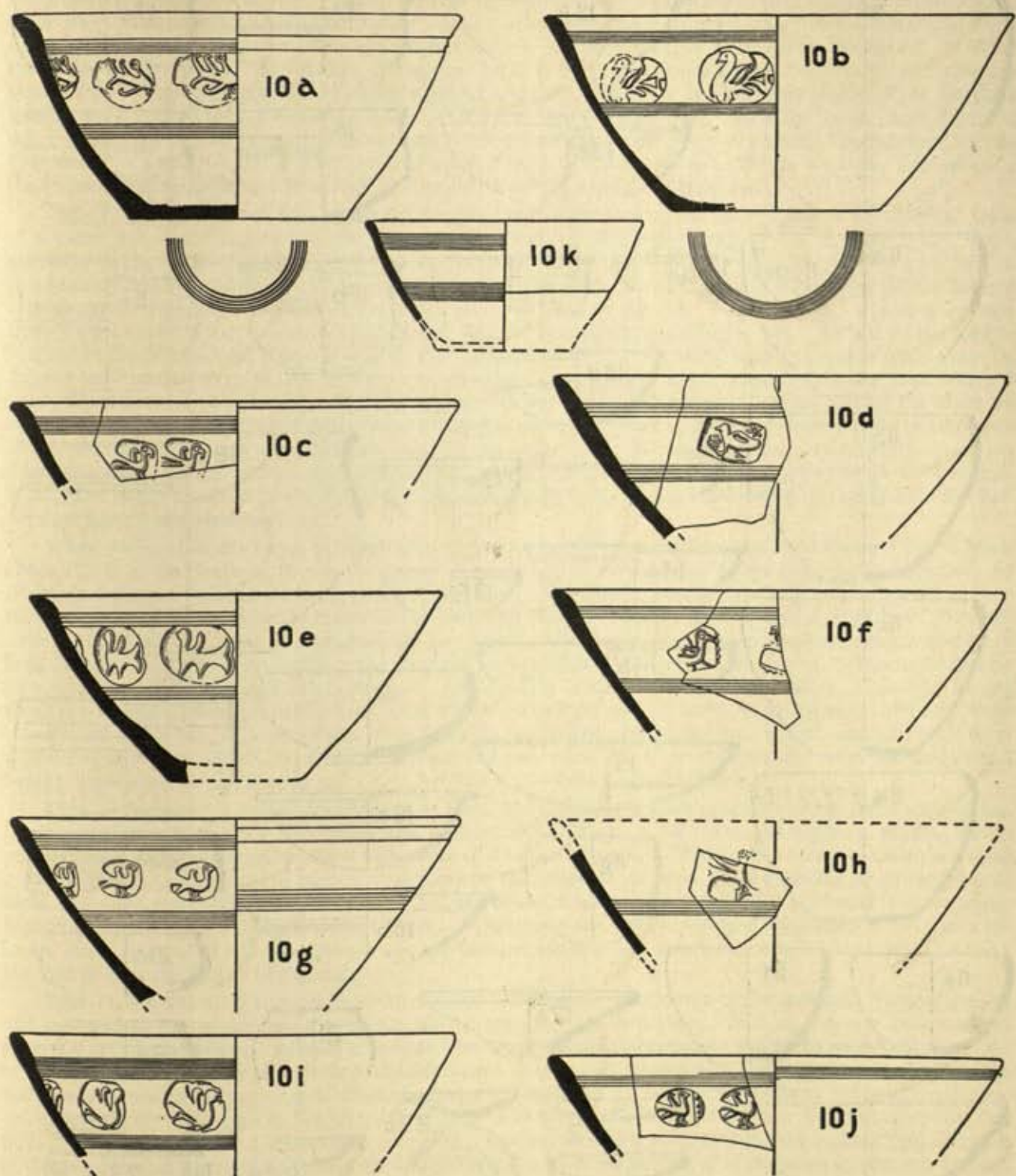


FIG. 17. Type 10.  $\frac{1}{2}$



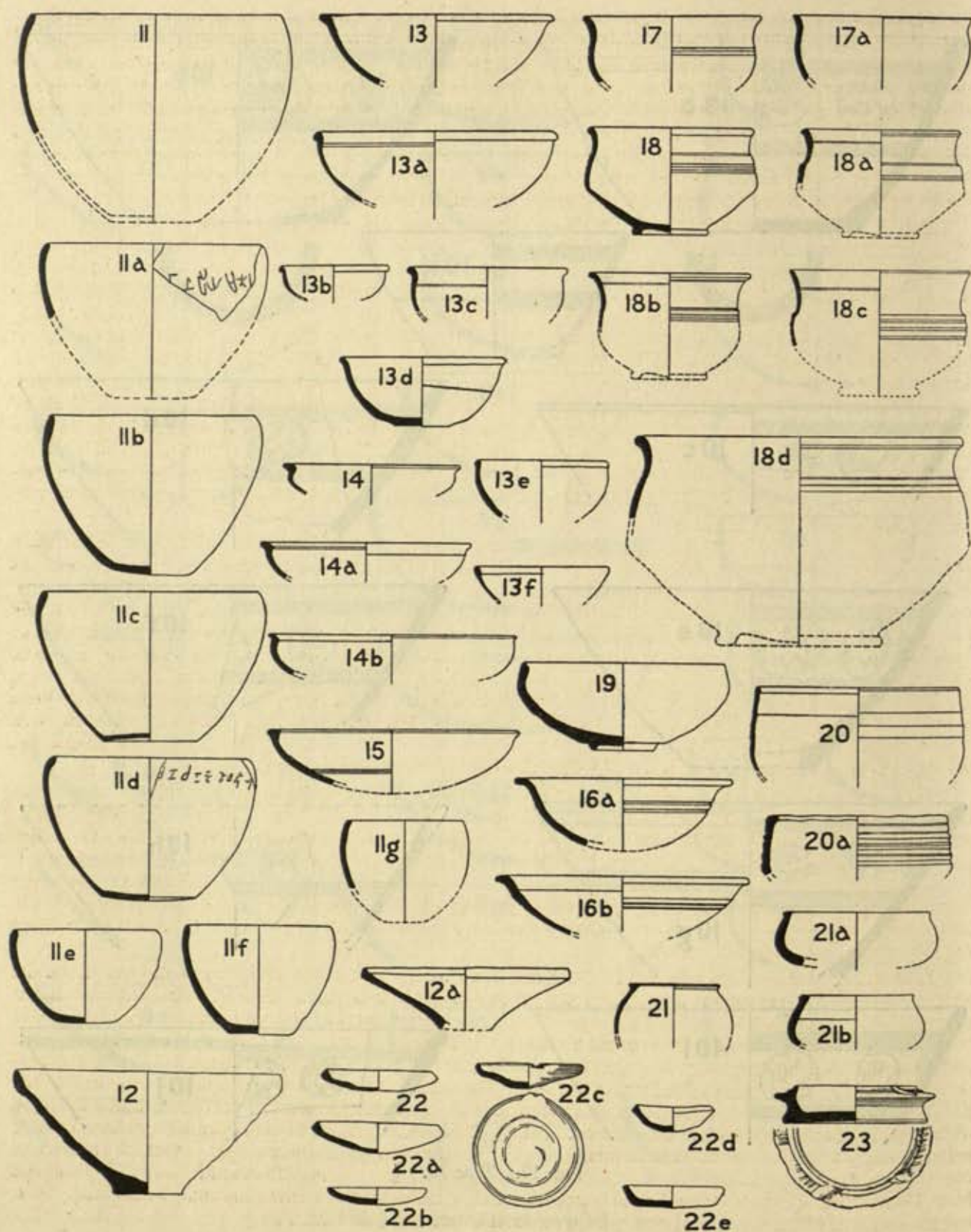


FIG. 18. Types 11-23.  $\frac{1}{4}$



the pronounced sag of their base. Again, variants 8*q-u* have a sharp carination as their common characteristic, while 8*w-x*, with roughly finished corrugated surface, belong to a separate sub-group which is characteristic of the later phases of the Southern Sector, though it starts in the post-Arretine period of the Northern. Some of the variants differ in their distribution. Thus 8*q* is found in the post-Arretine layers of the Northern Sector and throughout the occupation in the Southern, while 8*s-u* are confined to the post-Arretine period of the Northern Sector; 8*z* to Pottery Group A (Early Phase) of AK IV; 8*v* and 8*r* to the Early Phase and Main Drain Period of AK IV; and 8*y*, with an internally beaded rim, to the Late Phase of AK IV. A remarkable feature of variant 8*v* is that it is usually found in black-and-red ware, while a unique specimen of this in a smaller size occurs in the lowest Arretine-producing layer (AK II, 8 green) in polished black-and-grey ware.

Type 9 is a simple bowl with a rounded base and constitutes one of the major types of Arikamedu. It is of a coarse fabric and is generally grey (sometimes salt-glazed) in the pre-Arretine and Arretine layers, but is normally red in the post-Arretine period of the Northern Sector and is always red in the Southern Sector. It is invariably treated with slip both inside and out. Variants 9*a-c*, which are found throughout the occupation of both Sectors, slightly deviate from the arch-type in the form of the rim. Variant 9*a* has a thick and nearly straight rim, while 9*b* has an internally thickened rim, and 9*c* a similar but sharper one. Variant 9*d* is a unique bowl from the Main Drain Phase of AK IV with grooves below the rim and a slightly concave base, while 9*e*, from a pre-Arretine stratum (AK II, layer 13), resembles the arch-type in all respects save the base, which is markedly concave or omphaloid. Variants 9*f-g* are thicker wares with roughly finished surface on which no care has been taken to obliterate the corrugations produced by the wheel. These are characteristic of all phases of the Southern Sector, though they also occur occasionally in the Northern Sector, particularly in the post-Arretine period. Variants 9*h-l*, with pointed rims having a concave profile, form a group by themselves and, in addition to the standard grey and red colours, occasionally occur also in black-and-grey (confined to the pre-Arretine layers) and black-and-red.

While 9*h-i* and 9*k* are found in all periods of the Northern Sector and from the Pre-structural to the Main Drain Phase in the Southern Sector, the deeper bowls 9*j* and 9*l* are confined to the pre-Arretine layers of the Northern Sector. Variants 9*m-o* have taller sides, but, while 9*m* is peculiar to the pre-Arretine layers, 9*n-o* occur exclusively in the Arretine layers of the Northern Sector. Variant 9*p* is a unique little bowl from the Late Phase of AK IV, while 9*r* represents the tiny bowls which frequently occur throughout the occupation of both Sectors, usually in coarse grey or red ware and occasionally in fine greyish pink ware. Variants 9*q* (coarse grey ware) and 9*s* are unique bowls from the post-Arretine layers of the Northern Sector, while 9*t-v* having rims with a slight inward projection form a distinctive sub-group. Of the latter, 9*u* is represented by only three examples of which two, with bluish slip, come from the pre-Arretine layers and one in black-and-grey ware from a post-Arretine layer of AK II, while 9*t* in black-and-grey ware and 9*v* in common red ware are unique and belong respectively to an Arretine and a post-Arretine layer of the Northern Sector.

Type 10 represents a special form of cup or small bowl of grey, greyish pink or black-and-red ware of fine fabric, usually with a black slip inside and pink outside. It has a flat base and tapering profile, and is ornamented on the interior of the sides with a row of stamped medallions between two bands of multiple incised grooves, with a further band of concentric grooves on the inside of the base. The medallions represent fish or birds, including apparently the peacock. This is one of the characteristic shapes of the site and is occasionally found throughout the occupation of both Sectors. The only piece without stamped decoration is 10*k* (from the lowest Arretine layer of AK II), which is also the smallest example and may have been left unstamped as being too thin to bear the impact of the stamp.

Type 11 is a tall bowl with an incurved rim and a flat base. This is one of the principal types of the site and is found in fair abundance throughout the occupation of both Sectors. It is of a coarse fabric and is generally grey (sometimes salt-glazed) in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all periods of the Southern. It is usually treated with slip both inside and out. The arch-type is found in varying sizes of which the largest is illustrated. The next in popularity is 11*a* which slightly deviates from the main type in the form of the rim. The specimen illustrated bears a graffito inscription (see p. 111). Variants 11*b* and 11*d* (the latter also with a graffito) have sharply incurved rims and are very common in the pre-Arretine layers, though they are occasionally found in all periods of both Sectors. Variant 11*c* is a unique specimen from a pre-Arretine stratum (AK V, 9N) in that it has a concave base. Variant 11*e* from a pre-Arretine stratum (AK II, 14) is a small thick-walled bowl with a corrugated exterior, while 11*f* from the Main Drain Phase of the Southern Sector is another small thick bowl with a slight concavity at the base. The last variant, 11*g*, with a flat-topped rim, is from an Arretine stratum (AK VIII, 5).



Type 12 is a bowl with a wide mouth and small flat base and is distinguished by a corrugated tapering body. This type occurs throughout the occupation of both Sectors, but is relatively rare in the Northern Sector. It is of a coarse fabric, usually devoid of slip, and is generally grey in the pre-Arretine and Arretine layers and greyish red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variant 12a is an extremely rare type characterized by an oblique-edged rim and slightly concave tapering sides. It is of a coarse grey or greyish buff fabric and occurs only in the pre-Arretine and Arretine layers of the Northern Sector.

Type 13 is a grey-ware bowl of fine fabric with an externally beaded rim. This is an extremely rare type, the arch-type being represented by only three examples, all from the Southern Sector, and the variants by a single specimen each. One example of the arch-type comes from Pottery Group A (Early Phase), the second from a later layer of the Early Phase and the last from the Late Phase of AK IV. Both 13a and 13b—the latter a very small example—are greyish pink wares of fine fabric, from the Arretine horizon (AK VIII, 5; AK II, 8A). Variant 13c from a post-Arretine layer and 13d from a pre-Arretine stratum (AK II, 14) are deeper bowls of fine grey ware, the latter having a flat base and an inconspicuously beaded rim. Variant 13e is a deep red-ware bowl from the Pre-structural Phase of the Southern Sector, while 13f from a mixed group (AK VIII, pit 1) is also red ware but, unlike other examples of this type, has an internally beaded rim.

Type 14 is a shallow bowl with an everted rim and is another rare type. The arch-type is peculiar to the Arretine layers of the Northern Sector, while 14a and 14b are unique variants in fine grey ware, respectively from an Arretine stratum (AK II, 11C) and from Pottery Group A (Early Phase) of the Southern Sector.

Type 15 is represented by a unique example. It has a rounded base and convex rim, and is of a light black-and-red ware. It comes from an Arretine stratum (AK II, 7 Ar.).

Type 16 is a bowl distinguished by a flaring rim. It is represented by only two examples, of which 16a is coarse black-and-red ware from an unstratified deposit (AK I) of the Southern Sector, while 16b is of a greyish buff fabric with polished black slip inside from the post-Arretine Phase of the Northern Sector.

Type 17, a bowl with a flaring rim, is a rare type in polished black-and-grey ware and is confined to the Arretine layers of the Northern Sector. Variant 17a is a unique specimen in fine grey ware from Pottery Group A (Early Phase) of the Southern Sector. The shape of the bases of these bowls is unknown.

Type 18 represents a special class of fine grey or pinkish grey bowls of thin and well-burnt fabric. It is distinguished by a beaded rim, carinated waist and foot-ring, and has a grooved shoulder. It is noteworthy both for its rarity and for its careful potting. It is absent from the pre-Arretine layers of the Northern Sector and from the Late Phase of the Southern, but occasionally occurs in the Arretine and post-Arretine layers of the Northern Sector and in the Pre-structural to the Late Drain Phase of the Southern Sector. Variants 18b and 18c are unique examples, the former being from a mixed group (AK VIII, pit 1) and the latter from the unstratified French excavations; while 18d, which is nearly double the size, is peculiar to the post-Arretine period of the Northern Sector.

Type 19 is a unique bowl combining the profile of Type 9 with the foot-ring of Type 18. It is of a thick coarse greyish red fabric, and comes from the Main Drain Phase of the Southern Sector.

Type 20 is another rare type, representing a series of corrugated bowls which come exclusively from the Southern Sector. The main type is of thin black-and-red ware from the Pre-structural Phase, while variant 20a is a thicker greyish buff ware with an inturned rim from the Early Phase of AK IV. The shape of the bases of these bowls is unknown.

Type 21 is a tiny globular bowl with a beaked and flattened rim. This is one of the minor characteristic types of the site and is occasionally found throughout the occupation of both Sectors. It is of a coarse fabric and is generally grey in the pre-Arretine and Arretine layers and red both in the post-Arretine period of the Northern Sector and in all periods of the Southern. Variants 21a-b, in coarse greyish red ware, are thicker and squatter than the arch-type and occur exclusively in Pottery Group A (Early Phase) of the Southern Sector. The shape of the bases of these bowls is unknown.

Type 22 is a lamp. It is characteristic of the site and occurs throughout the occupation of both Sectors. It is of a coarse fabric and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all periods of the Southern. Variant 22a is of a larger and relatively less popular size; while 22b is a shallow red-ware lamp peculiar to the Late Drain Phase. Variant 22c, distinguished by a pinched soot-stained lip, is a rare variant, confined to the Late Phase of the Southern Sector. Variants 22d and 22e are solitary examples respectively from the Main Drain Phase of the Southern Sector and an Arretine layer (AK II, 7 Ar.) of the Northern.

Type 23 is a unique lamp with a flanged collar which is ornamented with slanting applied ridges and incised strokes. It is of coarse greyish black ware, and comes from a mixed group (AK VII, pit 2A) which yielded an



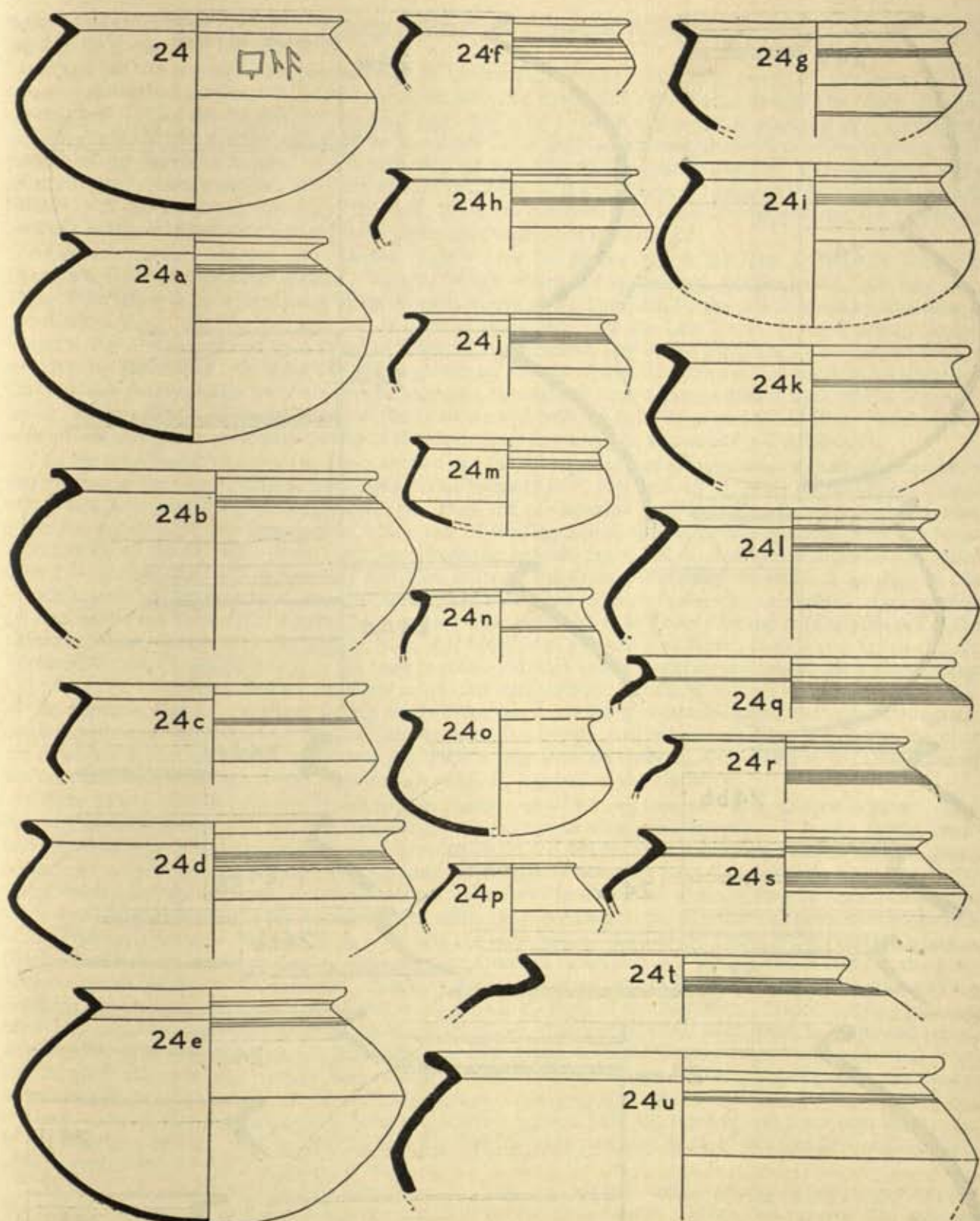


FIG. 19. Type 24.  $\frac{1}{4}$



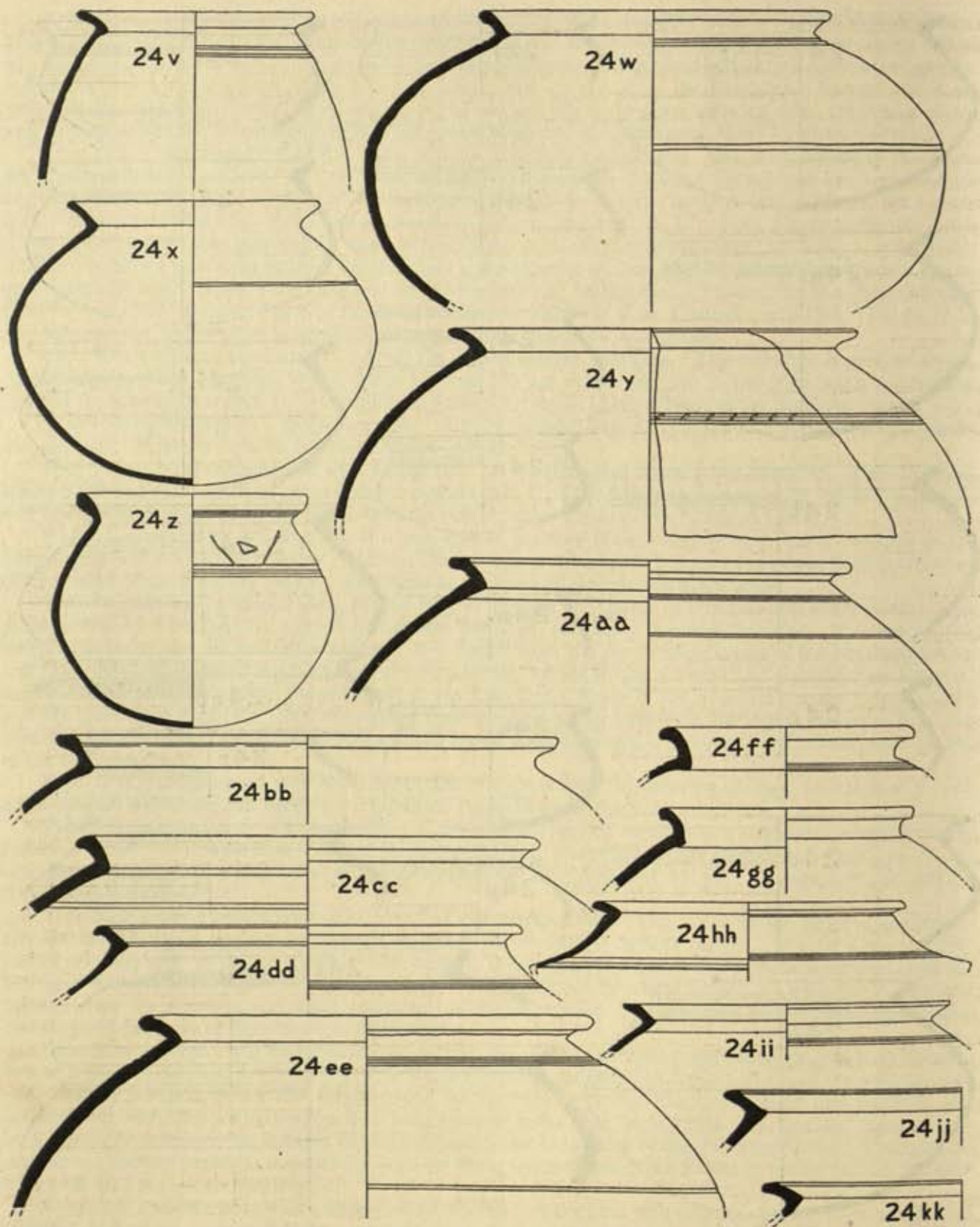


FIG. 20. Type 24 (continued).  $\frac{1}{4}$



Arretine bowl stamped CAMVR. It is not sufficiently well preserved to indicate the presence or absence of a pinched lip for holding the wick.

Type 24, which is the most popular type of Arikamedu, served as a cooking vessel, as is evident from its usually soot-stained exterior. It has a convenient carinated shape and a prominent flanged rim which afforded an easy grip. Like the majority of the local types this is of a coarse fabric and is generally grey (sometimes salt-glazed) in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern and in all periods of the Southern Sector. It is usually treated with slip on the exterior surface. The arch-type is the most abundant, though variants 24a-l and 24u are also found in fair profusion throughout the occupation of both Sectors. Of the numerous variants of the type, 24a-u are carinated and 24v-z are uncarinated, the remaining varieties being too fragmentary to show the presence or absence of carination.

Of the carinated varieties, 24a-l deviate slightly from the parent type in the form of the rim, while the remainder differ also in other details. Variants 24m-p, which are appreciably smaller vessels, are very rare. Thus, while 24n-o occur sporadically in the Arretine layers of the Northern Sector, 24p is a unique find from a pre-Arretine layer (AK V, 11a) and 24m (a diminutive of 24i) from the Late Phase of the Southern Sector. Variants 24o-t, distinguished by a series of ridges at the shoulder, just above the point of carination, form a sub-class by themselves. Of these 24q with a groove on the top of the rim occurs occasionally in all phases of the Southern Sector, while 24r-t are unique examples respectively from a post-Arretine layer of the Northern Sector, Pottery Group A (Early Phase) of the Southern and from an Arretine layer (AK V, 8N). Variant 24u, with a thick wall and a groove on the top of the rim, occurs frequently in all periods of both Sectors.

Of the uncarinated varieties, viz. 24v-z, the first and the last represent unique specimens with an elliptical body and distinctive rim-forms; derived from pre-Arretine layers (AK V, 10N and AK II, 14). Variant 24w is a large vessel with a pronouncedly bulging profile, also from the pre-Arretine level (AK II, 14), while varieties 24aa (from the same layer), 24y (ornamented with a row of slanting incised strokes on the shoulder, from the Main Drain Phase of the Southern Sector) and 24ee (from the Arretine layer, AK II, 8A) exhibit a profile analogous with 24w, though they are fragmentary and have different rim-forms. Variant 24x, which is peculiar to the earliest layer of the Pre-structural Phase of the Southern Sector, is a red-ware vessel with a globular body, originally covered with a lid, Type 28i. Variant 24bb is a red-ware pot peculiar to Pottery Group A (Early Phase) of the Southern Sector, but deviates very slightly from 24aa which is of a coarse grey fabric, from a pre-Arretine layer. Variant 24cc is a thicker derivative of the same in coarse red ware and is a solitary specimen from a mixed group (AK V, pit 1). 24dd and 24hh are two other unique red-ware variants, peculiar to Pottery Group A (Early Phase) of the Southern Sector. Variants 24ff-gg on the other hand, are fairly common shapes and occur throughout the occupation of both Sectors. Variant 24ii, however, is a unique red-ware vessel from the Early Phase of the Southern Sector, while 24jj in red ware and 24kk in grey ware are confined respectively to the Late Phase of the Southern Sector and the lowest Arretine layer (AK II, 8 green) of the Northern.

Type 25 is a shallow carinated frying pan, its function usually being indicated by a charred exterior. Like the cooking vessel (Type 24), this has a prominent flanged rim to afford an easy grip. It is of a coarse fabric and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all periods of the Southern. Variants 25a-f, slightly deviating from the arch-type, are occasionally found throughout the occupation of both Sectors. Variants 25g and 25k-l, distinguished by thick bodies with short rims, are peculiar to the pre-Arretine layers, while 25h is confined to the Arretine and post-Arretine periods of the Northern Sector. Variant 25i is a solitary red-ware pan of thick gritty fabric from Pottery Group A (Early Phase) of the Southern Sector, while 25j with a double carination is a unique specimen from the post-Arretine period of the Northern Sector. Similarly 25m is a solitary variant from the Main Drain Phase of the Southern Sector, and 25n from a pre-Arretine layer (AK V, 10N) of the Northern. Handled frying pans are extremely rare, with only four fragmentary examples, 25o-r, which differ from each other in shape and fabric. Variant 25o, of a coarse greyish red fabric from the Late Phase of the Southern Sector, has a horizontal loop-handle, while the remaining variants have vertical handles of similar shape. Variant 25p of greyish red ware is from a mixed group (AK VIII, pit 1), while 25q-r are of coarse grey ware, the former with greyish pink slip and the latter with chalky slip, respectively from the Arretine horizon (AK III, layer 6) and from near the surface of the Northern Sector. It is noteworthy that 25p and 25r have on either flank of the handle a nail-like projection, presumably a copy of a metal prototype.

Type 26 is a pan distinguished by a beaded rim. This is a rare type and invariably occurs in grey ware of fine fabric. It comes from the post-Arretine period of the Northern Sector. It has two variants, 26a and 26b, both from a mixed deposit.



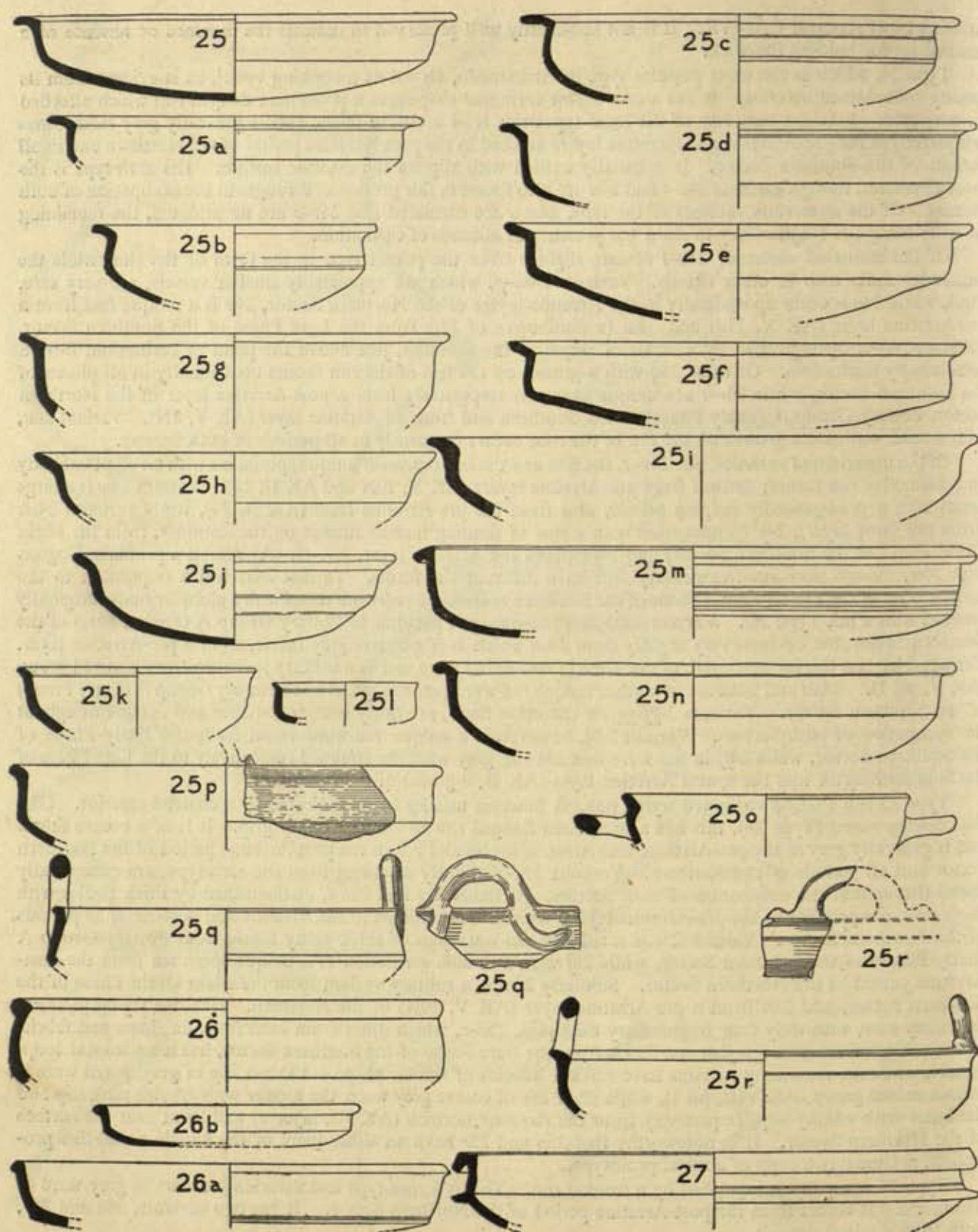


FIG. 21. Types 25-27.  $\frac{1}{4}$



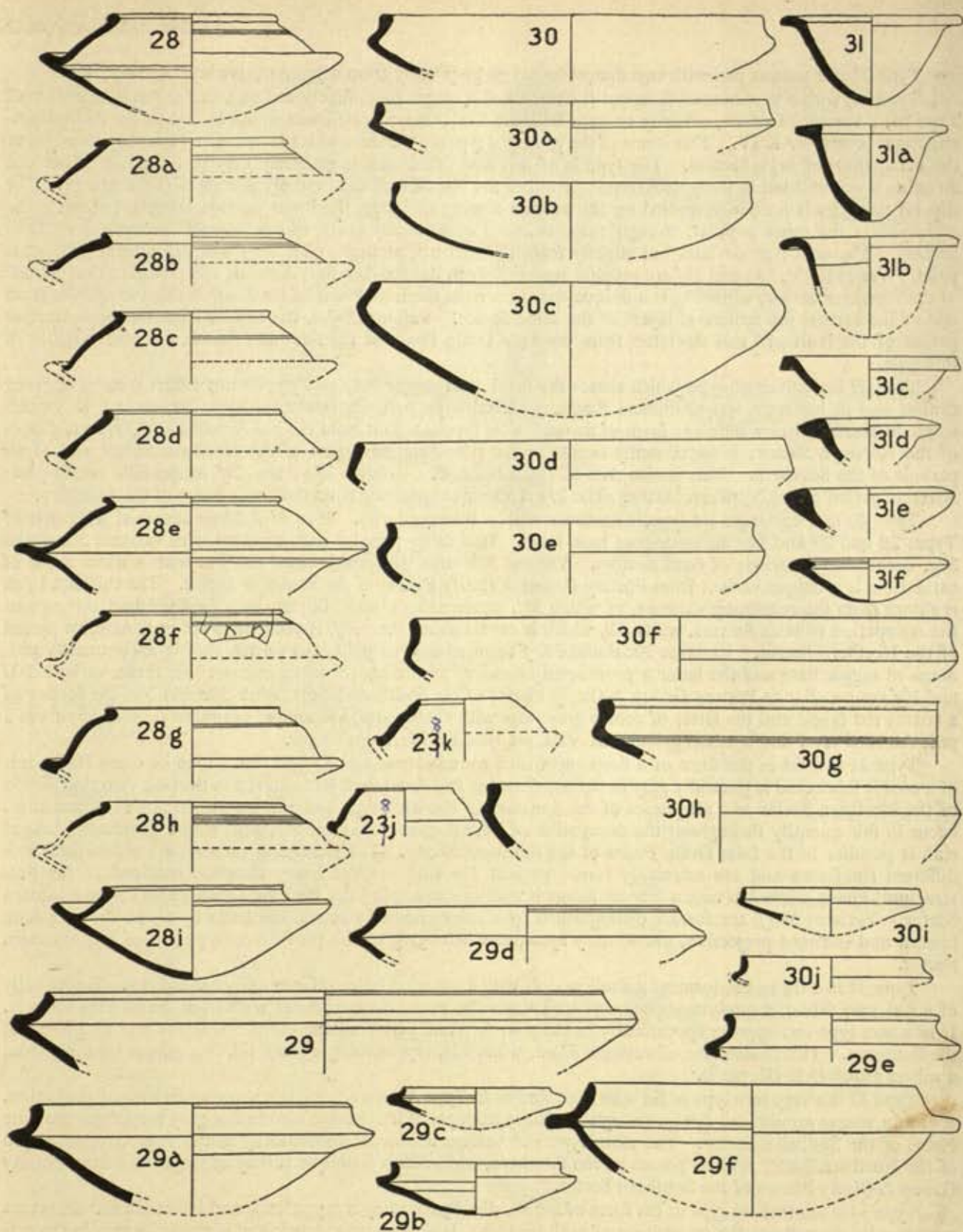


FIG. 22. Types 28-31.  $\frac{1}{4}$



Type 27 is a unique pan with two flanges in coarse grey ware, from a pre-Arretine layer (AK V, 9N).

Type 28, with a pronounced flange at the waist and a sagger base, functioned as a lid for the cooking vessel Type 21, a variety of which, actually covered with a lid of this type (28i), was found in one of the earliest pre-structural layers of AK IV. This is one of the principal types of the site and is present in fair quantity throughout the occupation of both Sectors. The type is of a coarse fabric and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all periods of the Southern. The slip on this type is normally applied on the portion above the flange, the lower portion being left plain. The arch-type is the most popular, though variants 28a-d occasionally occur throughout the occupation of both Sectors. The arch-type deviates but slightly from the variants, among which 28e-f and 28g-h form analogous pairs. Variants 28e, 28h and 28f are peculiar respectively to the pre-Arretine, Arretine and post-Arretine periods of the Northern Sector, while 28g is a unique specimen from the Late Phase of the Southern Sector and 28i from one of the earliest pre-structural layers of the same Sector. Variants 28j-k, the former from the post-Arretine period of the Northern and the latter from the Late Drain Phase of the Southern Sector, are rare varieties of this type.

Type 29 is another lid-type which shares the fabric and sagger base of Type 23 but differs from it in being rimless and in having a less prominent flange. Its arch-type partially resembles Type 28i, though it is much larger in size and has a different form of flange. This type is absent from the pre-Arretine and Arretine phases of the Northern Sector; it occasionally occurs in the post-Arretine period of the Northern Sector and at all periods of the Southern. This is also true of variants 29a-b. Variants 29c-d and 29f are peculiar to the post-Arretine period of the Northern Sector, while 29e is a unique specimen from the Early Phase of the Southern.

Type 30 is a carinated lid-type, sometimes with a thickened rim. It is of a fabric identical with that of Types 28 and 29 and has an analogous base form. It is fairly popular and, together with variants 30a-b and 30g, occurs in all periods of both Sectors. Variant 30b, also with a thickened rim but with a wider angle of carination, is a unique variant from Pottery Group A (Early Phase) of the Southern Sector. The thickened rim is absent from the remaining varieties, of which 30j, representing a small lid, is occasionally found throughout the occupation of both Sectors, while 30i, which is even smaller than 30j, is peculiar to the post-Arretine period of the Northern Sector. Variants 30c-d and 30e-f form analogous pairs, the former having an unusually pronounced sagger base and the latter a prominently concave profile above the carination. Of these, variants 30d and 30f are peculiar to Pottery Group A (Early Phase) of the Southern Sector, while 30c and 30e, the former of a coarse red fabric and the latter of coarse grey ware with chalky slip, are unique examples respectively from a post-Arretine layer and a mixed group (AK VIII, pit 1) of the Northern Sector.

Type 31 is a lid in the form of a deep cup with a rounded base and flanged rim. Like lid-types 28-30, it is of a coarse fabric and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. The arch-type and variant 31a, which is closest to it, occur in fair quantity throughout the occupation of both Sectors. Variant 31b, also with a prominent flanged rim, is peculiar to the Late Drain Phase of the Southern Sector. The remaining variants are all shallow with different rim-forms and are extremely rare. Variant 31c with a short heavy flange is confined to the Pre-structural Phase, while 31d with a heavier flange is a unique example from the Late Drain Phase of the Southern Sector. Variants 31e-f, the former distinguished by a thick clubbed rim and the latter by a rim showing both inward and outward projection, are solitary specimens belonging to the post-Arretine period of the Northern Sector.

Type 32 is a lid in the form of a shallow dish with a rounded base and internally beaded rim. It is usually of a fine grey fabric, though two specimens are known also in coarse greyish red ware from the Southern Sector. It is a rare type but appears sporadically in the post-Arretine period of the Northern Sector and all phases of the Southern. This is also true of variants 32a-b, while 32c, representing a small lid, is a unique example from a mixed group (AK III, pit 2).

Type 33 is a very rare type of lid with base similar to Type 32 and a thick rim showing an inward projection. It is of a coarse greyish red fabric, though a solitary example of it is known also in fine grey ware from the Late Phase of the Southern Sector. The main type and variant 33a occur sporadically in the post-Arretine period of the Northern Sector and all phases of the Southern, while 33b is a unique variety of larger size from Pottery Group A (Early Phase) of the Southern Sector.

Type 34 is another lid-type in the form of a dish, distinguished by a sagger base and inverted rim. It occurs occasionally throughout the occupation of both Sectors. It is of a coarse fabric and is generally grey in the pre-Arretine and Arretine and red in the post-Arretine period of the Northern Sector and all periods of the Southern.



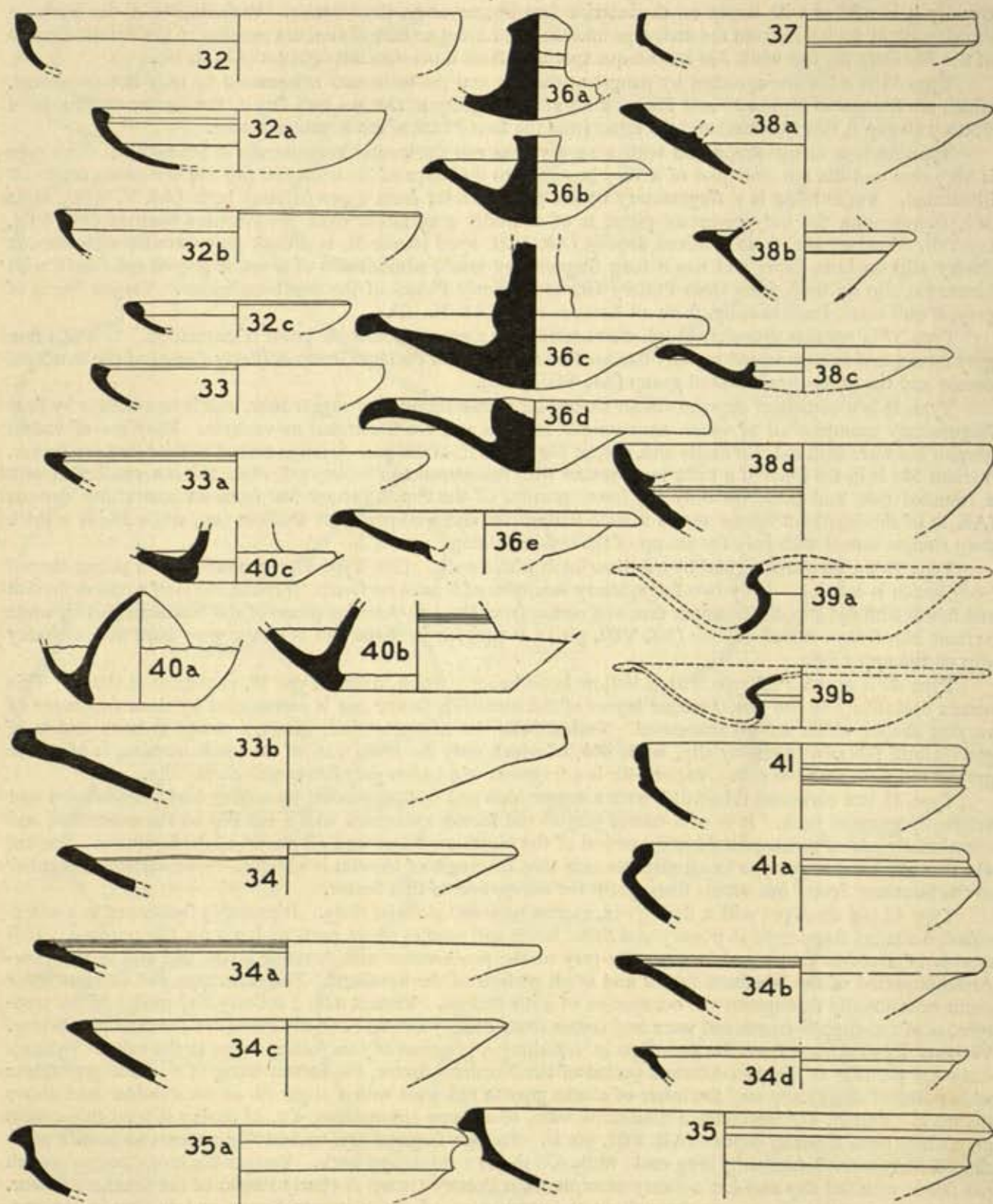


FIG. 23. Type 32-41.  $\frac{1}{2}$



Usually it is treated with a slip on the interior face but never on the exterior. Variants 34a-c, the first two showing slight deviation from the arch-type and the last having a clubbed rim, are peculiar to the Arretine layers of the Northern Sector, while 34d is a unique specimen from a pre-Arretine stratum (AK II, 14).

Type 35 is a lid distinguished by flanges at the rim and the waist and represented by only two specimens, which are illustrated (Types 35 and 35a). Both are of a gritty micaceous buff fabric, the former coming from Pottery Group A (Early Phase) and the latter from the Late Phase of the Southern Sector.

Type 36 is a saucer-shaped lid with a sagger base and thick solid knob-handle in the middle. This type is very rare and the few examples of it vary in regard to the shape of the knob and rim and are consequently all illustrated. Variant 36a is a fragmentary coarse grey-ware lid from a pre-Arretine layer (AK V, 10N), while 36b, representing the only complete piece, is of a cruder grey fabric from the Arretine horizon (AK VIII, layer 5). Variant 36c, from a mixed deposit (AK VIII, spoil trench 3), is a thick grey-ware lid with smooth chalky slip on both faces and has a long fragmentary knob, while 36d is of a coarse greyish red fabric with haematite slip on both faces from Pottery Group A (Early Phase) of the Southern Sector. Variant 36e is of greyish buff ware, knob missing, from an Arretine layer (AK II, 10A).

Type 37 is another dish-shaped lid, characterized by a groove below the point of carination. It is of a fine grey fabric, and is represented by only two specimens, one from Pottery Group A (Early Phase) of the Southern Sector and the other from a mixed group (AK VIII, pit 3).

Type 38 is a combined cup-and-saucer shaped lid with a rounded or sagger base, and is represented by four fragmentary examples all of which have unique features and are illustrated as variants. They are of coarse greyish red ware with red slip inside and, except 38e, come from the post-Arretine period of the Northern Sector. Variant 38a is in the form of a thick large saucer with the central cup broken off, while 38b is a smaller lid with a rounded base and preserves only the lower portion of the cup. Variant 38c from an unstratified deposit (AK I) of the Southern Sector shows a wide flaring rim and well-preserved shallow cup, while 38d is a thick deep rimless saucer with only the stump of the cup remaining.

Type 39 is a lid characterized by a hollow knob with a neck. Like Type 38, it probably had a saucer-shaped body which is missing. Only two fragmentary examples of it have survived. Variant 39a is of a coarse greyish red fabric with red slip on the upper face and comes from the post-Arretine phase of the Northern Sector, while variant 39b, from a mixed deposit (AK VIII, pit 1), is squatter in shape and of coarse grey ware with a chalky slip on the upper face.

Type 40 is another lid-type with a hollow knob-handle, which, unlike Type 39, is conical in shape. This occurs exclusively in the post-Arretine layers of the Northern Sector and is represented by three fragments of varying shapes which are all illustrated. Variant 40a, the best-preserved, shows a complete knob and is of greyish buff fabric with chalky slip, while 40b, of which only the lower half of the knob remains, is of coarse greyish red ware with red slip. Variant 40c is a fragment of a coarse grey fabric with chalky slip.

Type 41 is a carinated lid or dish with a sagger base and is distinguished by a thick body, beaded rim and externally grooved neck. It is of a coarse greyish red fabric, sometimes with a red slip on the outer face, and occasionally occurs in the post-Arretine period of the Northern Sector and all phases of the Southern. Variant 41a resembles the main type in all respects save that the angle of the rim is oblique. This variant is peculiar to the Southern Sector but occurs throughout the occupation of that Sector.

Type 42 is a small pot with a flaring rim, narrow neck and globular body. It probably functioned as a water-vessel, a similar shape both in pottery and metal being still used in many parts of India for this purpose. This type is of a coarse fabric and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and at all periods of the Southern. The main type and variants 42b-c occur occasionally throughout the occupation of both Sectors. Variant 42a, a solitary tiny model of the arch-type, is of red-slipped coarse red ware and comes from Pottery Group A (Early Phase) of the Southern Sector. Variants 42b-d deviate from the arch-type in exhibiting a progressively increasing bulge at the belly. Variants 42d-e are peculiar to the post-Arretine period of the Northern Sector, the former being of a coarse grey fabric with polished chalky slip and the latter of coarse greyish red ware with a slight rib at the shoulder and above the neck. Variant 42f represents a diminutive vase, of a shape approaching 42e, of chalky slipped thin coarse grey ware, from a mixed deposit (AK VIII, pit 3). Though fragmentary, variant 42g appears to have a pear-shaped body with an unusually long neck, while 42h shows a still longer neck. Variant 42g is of a coarse greyish red fabric with red slip and is a solitary example from Pottery Group A (Early Phase) of the Southern Sector. Variant 42h occasionally occurs throughout the occupation of the Northern Sector and is grey in the pre-Arretine and Arretine layers and red in the post-Arretine. Variants 42i-j are rare; they are of a red-slipped



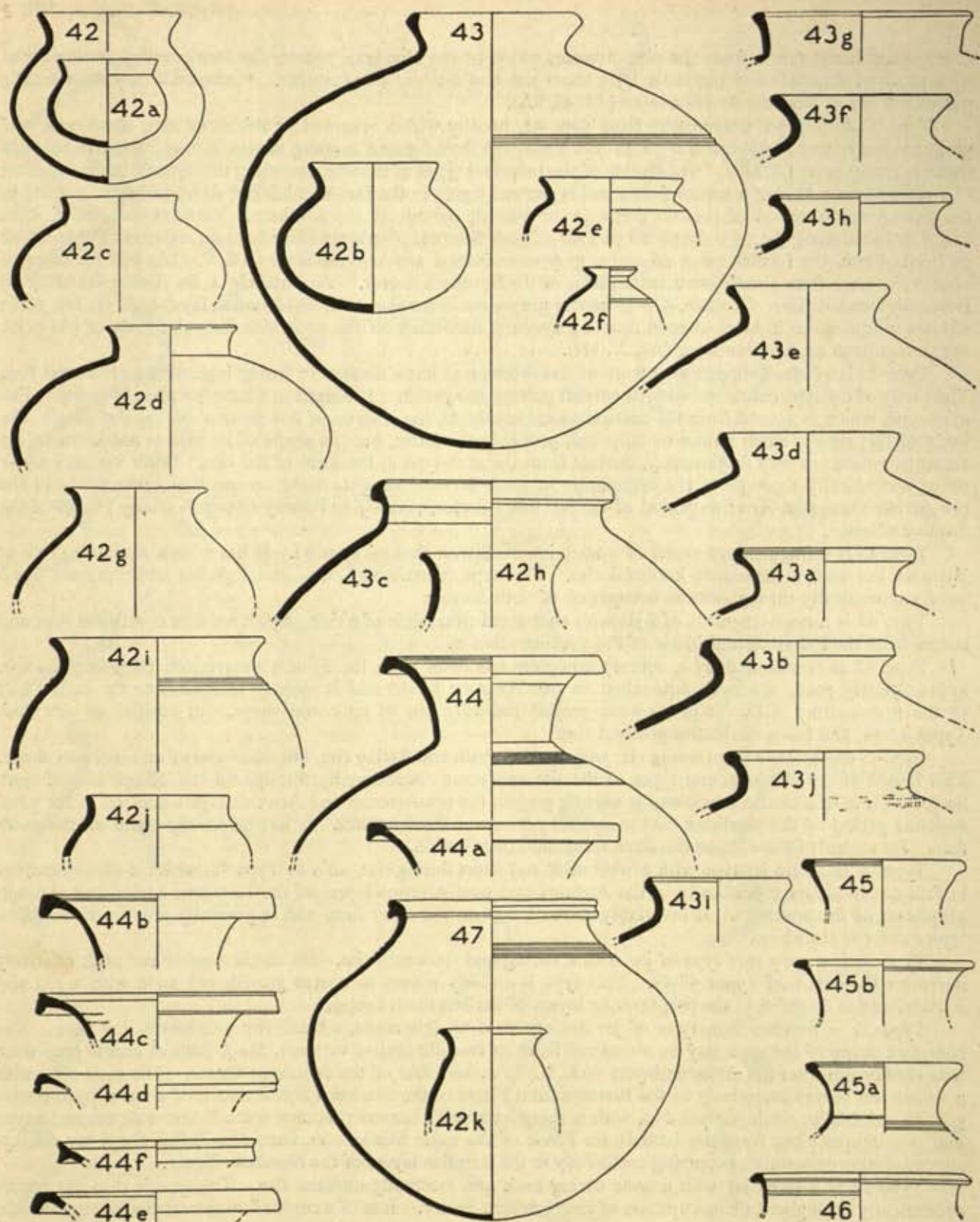


FIG. 24. Types 42-47.  $\frac{1}{4}$



coarse greyish red fabric from the post-Arretine phase of the Northern Sector, the former being distinguished by a grooved shoulder and the latter by a short rim and a rib at the shoulder. Variant 42*k* is a unique little pot of buff ware, from an Arretine layer (AK II, 8A).

Type 43 is a larger water-vessel than Type 42, usually with a recurved or thickened rim, short neck and globular body, and is doubtless a *ghaṭa* (i.e. vessel for fetching and keeping water) as used down to modern times in many parts of India. This is one of the principal types of the site, occurring throughout the occupation of both Sectors. It is of a coarse fabric and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all periods of the Southern. Variants 43*a*, 43*d-f*, 43*h-i* and 43*k* occasionally occur through all periods of both Sectors. Variants 43*b-c* have an exceptionally recurved or hooked rim, the former being of coarse grey ware from a pre-Arretine layer (AK V, 11A) and the latter of coarse red ware from the Pre-structural Phase of the Southern Sector. Variants 43*g-k* are distinguished by an internally beaded rim. Of these, 43*g* in coarse grey ware is peculiar to a pre-Arretine layer (AK II, 14), while 43*j* is a unique piece in black-slipped coarse grey ware, decorated on the neck with irregular rows of pin-prick ornament, from an Arretine layer (AK V, 8N).

Type 44 is of black-slipped grey ware of fine fabric, and has a distinctive flaring high neck and everted rim. The rarity of the type combined with its careful potting shows that it belonged to a superior class of vessel. The arch-type, which is figured from the best preserved specimen, has a series of fine grooves on the shoulder. The body of this type is either round or elliptical, probably the latter, but the shape of its base is not known. Its variants, which are very fragmentary, deviate from the arch-type in the form of the rim. While variants 44*a-c* occur sporadically throughout the occupation of both Sectors, variants 44*d-e* are peculiar respectively to the pre-Arretine and post-Arretine period of the Northern Sector, and 44*f* to Pottery Group A (Early Phase) of the Southern Sector.

Type 45 is a fragmentary vessel of a ware identical with that of Type 44. It has a neck similar to that of Type 44 but with a distinctive knobbed rim. This type is extremely rare, and together with variants 45*a-b* occurs sporadically throughout the occupation of both Sectors.

Type 46 is a neck-fragment of a jar with an everted rim. It is of a thin greyish red fabric with red slip, and comes from the Pre-structural Phase of the Southern Sector.

Type 47 is represented by a solitary complete specimen from the French excavations (Northern Sector, approximately mean sea-level, equivalent to our Arretine levels) and is roughly assignable to the earlier half of the first century A.D. It is a coarse greyish red-ware pot of an ovoid shape, but smaller in size than Types 43-44, and has a distinctive grooved rim.

Type 48 represents a large storage jar with a wide mouth and flaring rim, but otherwise of an unknown shape. This is one of the characteristic types of the site and occurs occasionally throughout the occupation of both Sectors. It is of a coarse fabric and is usually grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all periods of the Southern. It has invariably a slip on the outer face. Its variants (48*a-e*) have the same fabric and distribution.

Type 49 is a rare jar-type with a wide neck and short flaring rim, akin to Type 48, which it also resembles in fabric. It occurs sporadically in the Arretine and post-Arretine layers of the Northern Sector and through all phases of the Southern. It invariably shows a slip on the outer face, and is generally grey in the Arretine layers and red elsewhere.

Type 50 is a very rare type of jar with a flaring and thickened rim. Its size is smaller and neck relatively narrower than that of Types 48-49. This type invariably occurs in coarse greyish red ware with a red slip outside, and is confined to the pre-Arretine layers of the Northern Sector.

Type 51 is another rare type of jar distinguished by thin walls, a small rim and hardly any neck. The complete shape of the type may be visualized from its two diminutive variants, 51*e-f*, both of coarse grey ware with chalky slip from the Arretine layers (AK II, 7 Ar. and 8A) of the Northern Sector. The main type with a rolled rim occurs exclusively in the Pre-structural Phase of the Southern Sector and is of a red-slipped coarse greyish red fabric; while variant 51*a*, with a sharp externally beaked rim, shares the fabric with the main type and is a unique piece from the Late Drain Phase of the same Sector. Variants 51*b-d*, like 51*e-f*, are chalky-slipped coarse grey wares, occurring exclusively in the Arretine layers of the Northern Sector.

Type 52 is a large jar with a wide flaring neck and externally clubbed rim. The type is rare but occurs sporadically throughout the occupation of the Northern Sector. It is of a coarse fabric treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine, though exceptional red examples occur in the pre-Arretine and grey in the post-Arretine period. Of the variants, 52*a* is



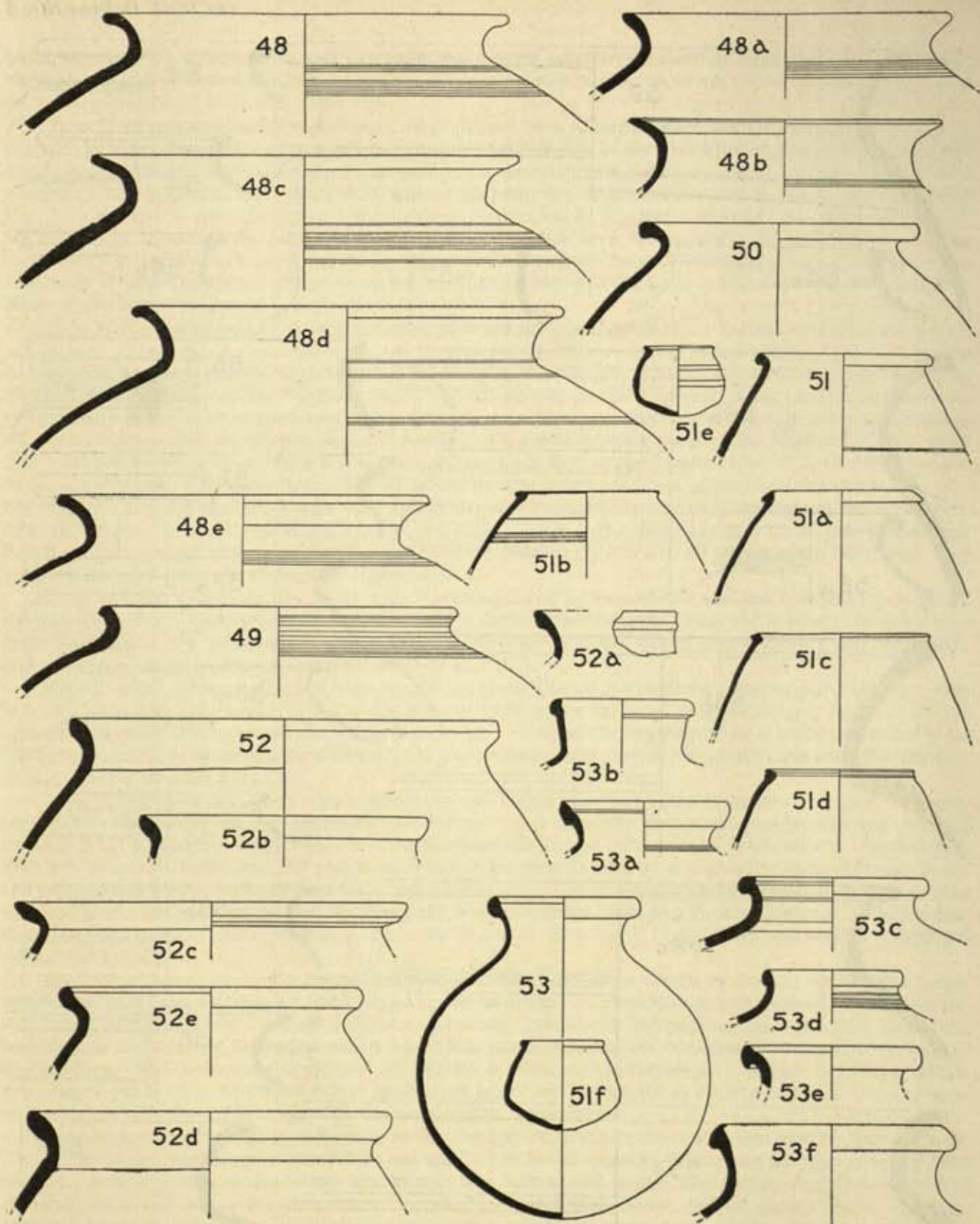


FIG. 25. Types 48-53.  $\frac{1}{4}$



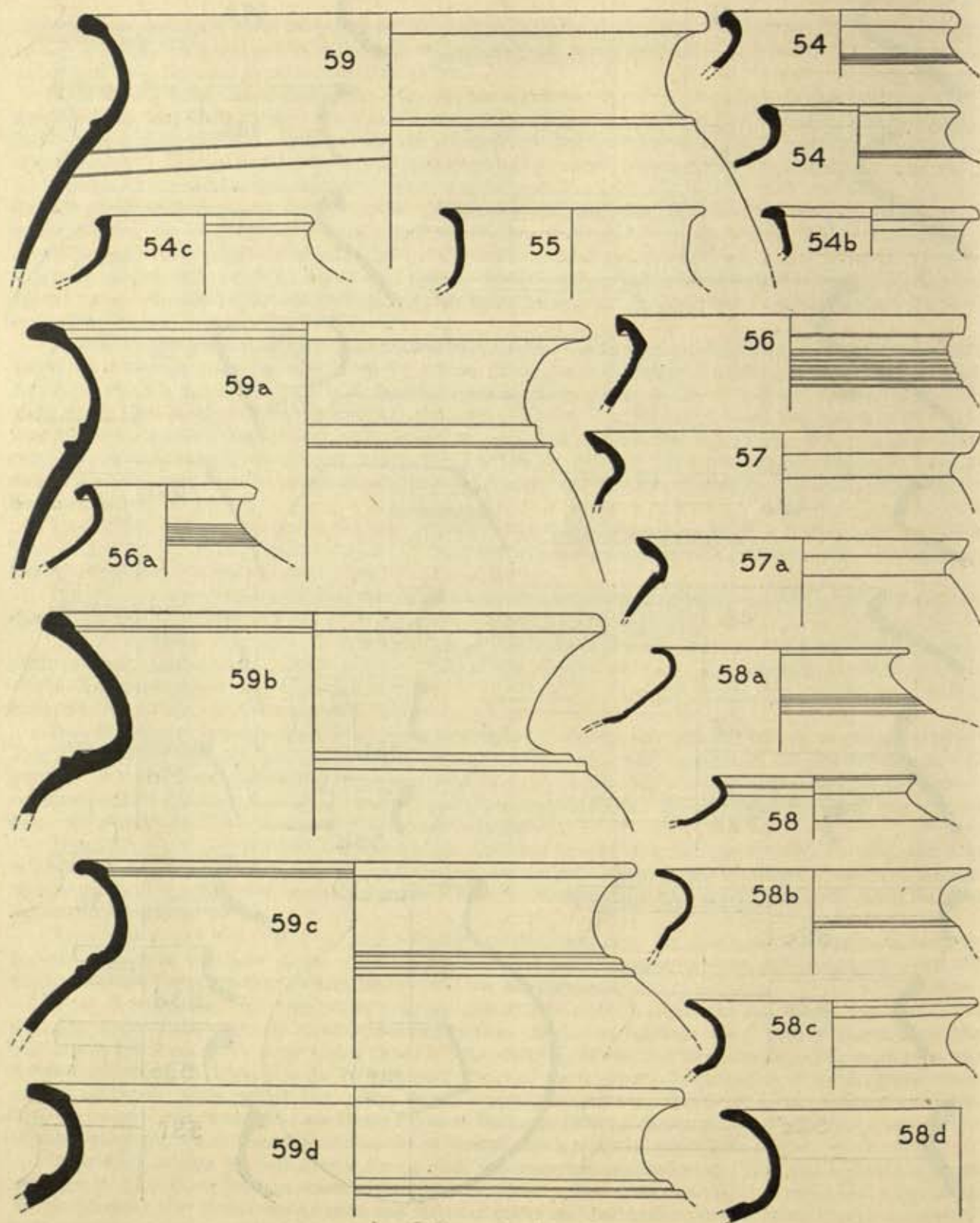


FIG. 26. Types 54-59.  $\frac{1}{4}$



characteristic of the Arretine layers with an occasional overlap into the post-Arretine phase, while 52b-e, the last showing a slightly recurved rim, are peculiar to the post-Arretine phase. A solitary specimen of variant 52c is of coarse greyish black ware with black slip.

Type 53 represents a small water-vessel, characterized by a spherical body, narrow neck and pronounced rim with an internal groove. It is a rare type but occurs sporadically in the post-Arretine period of the Northern Sector and all phases of the Southern. The type is of a coarse greyish red fabric, usually treated with red and sometimes with haematite slip. A freak variant of this type, 53e, is of a coarse greyish black ware with black slip from the lowest Arretine layer of the Northern Sector (AK II, 8 green). Variant 53a, which is closest to the main type, is peculiar to the post-Arretine period of the Northern Sector, while 53b and 53d are confined respectively to the Pre-structural and Early Phase of the Southern Sector. Variants 53c and 53f are neck-fragments of larger jars, the former coming from a mixed group (AK VIII, pit 1) and the latter from the Late Phase of the Southern Sector.

Type 54 is a medium-sized jar with a narrow neck and thick out-turned rim. The shape of its lower part is not known. This type is occasionally present throughout the occupation of both Sectors. It is of a coarse fabric, usually treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine layers of the Northern Sector and all periods of the Southern, though red examples occur exceptionally in the pre-Arretine layers and grey in the post-Arretine. Variants of this type are rare. Variant 54a, of a chalky-slipped coarse grey fabric, is peculiar to the post-Arretine phase of the Northern Sector, while 54b, of red-slipped coarse greyish red ware, is a unique piece from a pre-Arretine layer (AK II, 14). Variant 54c is of red-slipped coarse red ware and comes from the Pre-structural Phase of the Southern Sector.

Type 55 is a rare jar with a high neck and flaring rim, occurring sporadically throughout the occupation of both Sectors. It is of a coarse fabric treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. The shape of this type below the shoulder is unknown.

Type 56 is the upper part of a fairly large jar distinguished by an undercut rim and a series of grooves on the shoulder. It is a type confined to the post-Arretine phase of the Northern Sector and is invariably of a coarse greyish red fabric with polished red slip (often of haematite). Variant 56a, of coarse greyish buff fabric with pale red slip, is derived from an Arretine layer (AK II, 7 Ar.).

Type 57 is the upper portion of a large jar with obliquely flanged rim, wide neck and ledged shoulder. This is a very rare type, represented by a few examples of light red or chalky-slipped coarse grey fabric, from the Arretine and post-Arretine phases of the Northern Sector. Variant 57a, represented by a solitary specimen from the Late Drain Phase of the Southern Sector, is of a red-slipped coarse greyish red fabric and shows a sharper nick at the shoulder than the main type.

Type 58 is a jar of thin ware, with a flaring rim and ledged shoulder. This is another rare type, occurring sporadically throughout the occupation of both Sectors. It is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all periods of the Southern. Variant 58a, of a thin micaceous buff fabric and with a more flaring rim than the arch-type, is peculiar to the Arretine layers of the Northern Sector, while variants 58b-c, with more splayed rims and sharper shoulder-ledges, are of a fine light red fabric and occur in the Early Phase of the Southern Sector, including Pottery Group A. Variant 58d, from the Late Phase of the same Sector, shares the shape of 58b-c but is of a thicker and coarser greyish red fabric with red slip.

Type 59 represents one of the largest and most characteristic storage-vessels of the site, with a wide flaring mouth, thickened rim and one or more ridges on the shoulder. It is present in fair quantity throughout the occupation of both Sectors. It is of a thick coarse fabric, treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all periods of the Southern. This is also true of variants 59a and 59c-d, which occur everywhere. Variant 59b with a thicker and blunter rim is of a red-slipped coarse greyish red fabric and is peculiar to Pottery Group A (Early Phase) of the Southern Sector. The shape of the base of this type is unknown.

Type 60 is a large storage-jar with wide mouth, sharply everted rim, short neck and multi-ridged shoulder. This is one of the characteristic types of the site and occurs in fair quantity throughout the occupation of both Sectors. It is of a thick coarse fabric, treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variants 60a-b share the range of fabric and distribution of the arch-type, while variant 60c, of a red-slipped coarse greyish red fabric, is peculiar to Pottery Group A (Early Phase) of the Southern Sector. The specimen



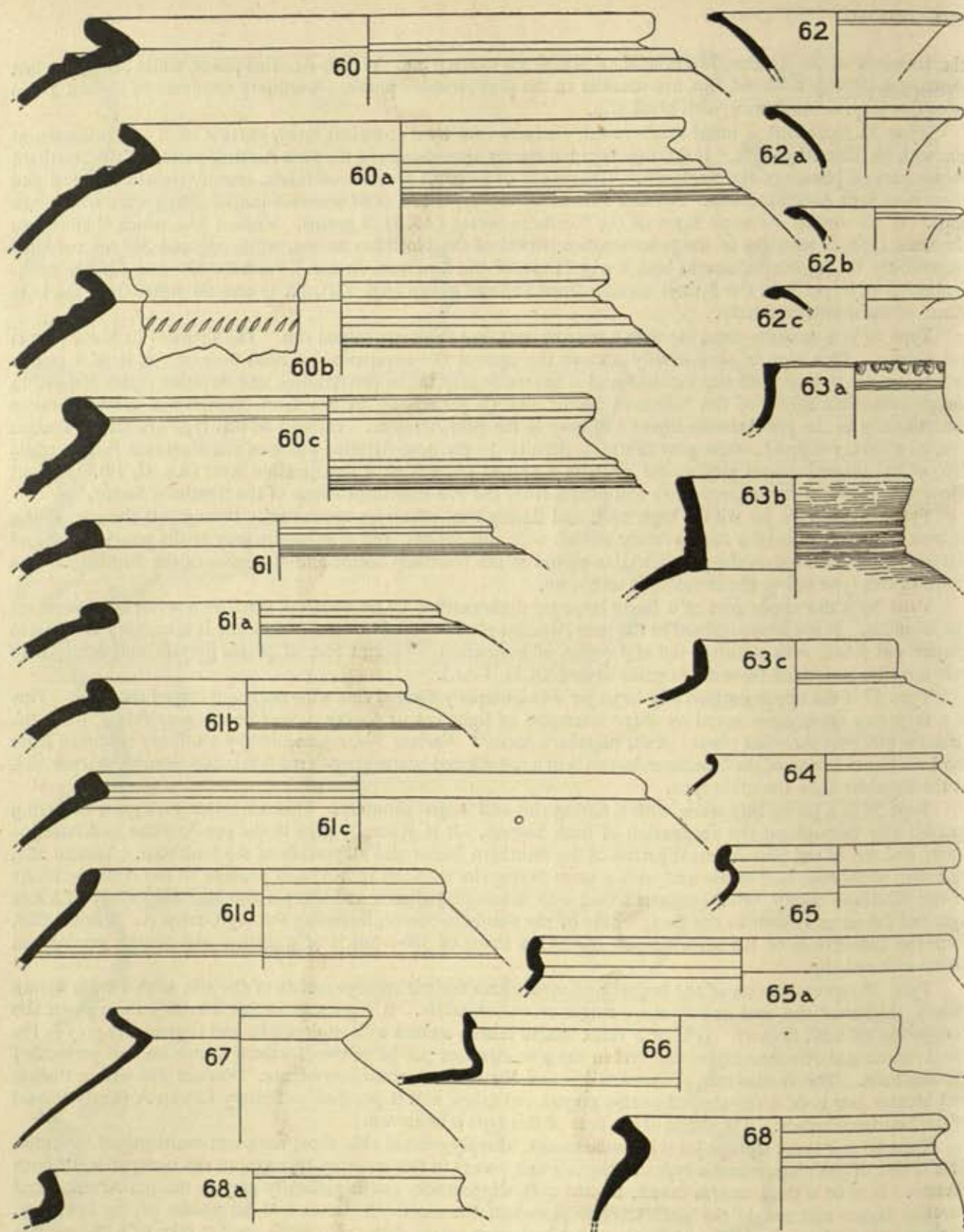


FIG. 27. Types 60-68.  $\frac{1}{4}$



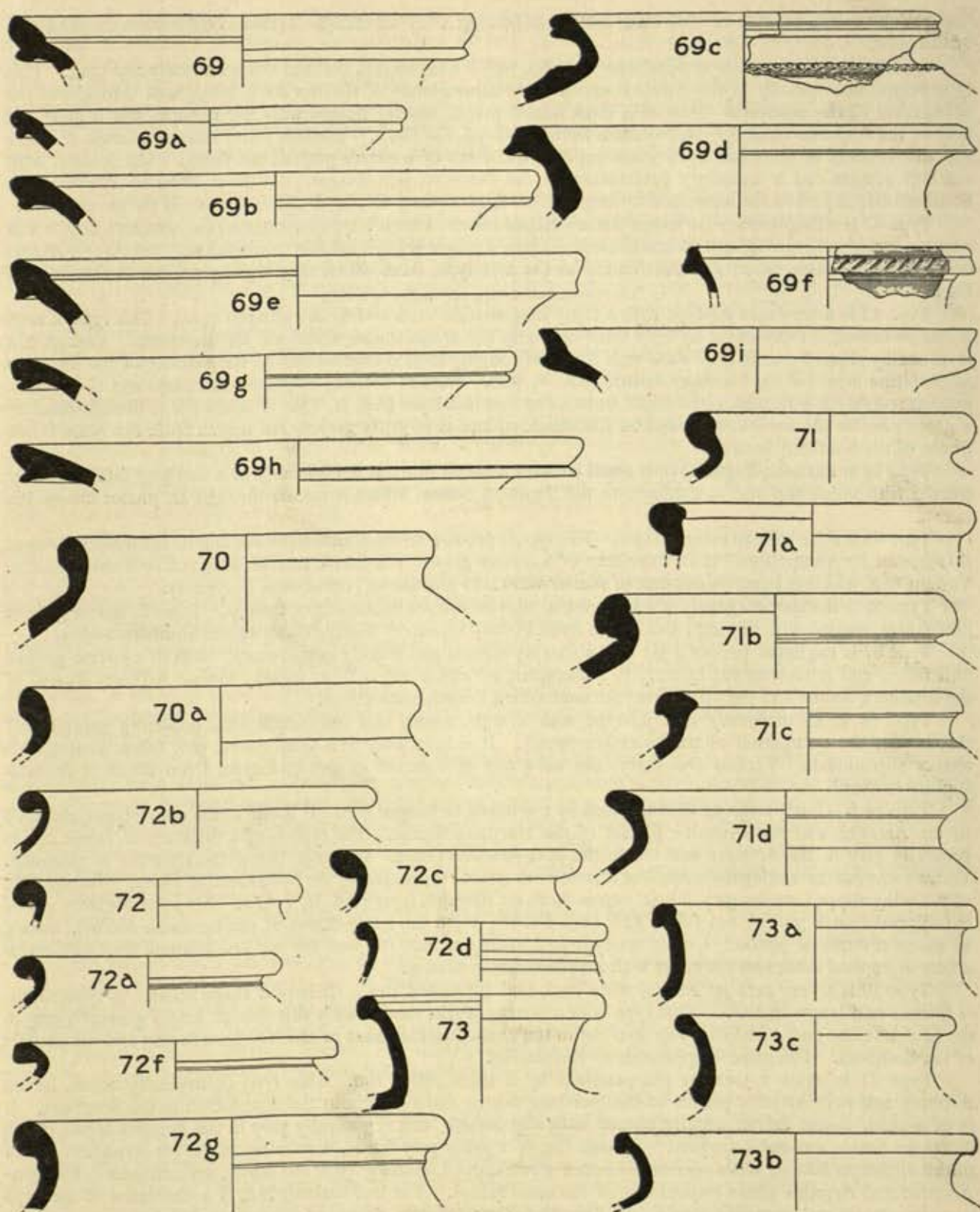


FIG. 28. Types 69-73.  $\frac{1}{4}$



illustrating variant 60*b* has an individual feature in bearing a row of oblique slashes as decoration on the inside of the neck.

Type 61 is a jar of a size smaller than Type 60, with a wide mouth, clubbed rim and hardly any neck. This type occurs occasionally in the Arretine and post-Arretine phases of the Northern Sector and throughout the occupation of the Southern. It is of a thick coarse fabric, usually treated with slip outside, and is generally grey in the Arretine layers of the Northern Sector and red elsewhere. Variants 61*a-b* share the range of fabric and distribution of the main type, while variants 61*c-d* are of a coarse greyish red fabric. The former, with red slip outside and a secondary perforation on the shoulder, is a unique piece from the Late Phase of the Southern Sector, while the latter is a solitary variant from Pottery Group A (Early Phase) of the same Sector.

Type 62 is a fragmentary jar with a funnel-shaped neck. This is a type confined to the Southern Sector and occurs sporadically throughout its occupation. It is of a coarse greyish red fabric, treated with red slip. Variants 62*a-c* have the same fabric and distribution as the arch-type, from which they slightly deviate in the form of the rim.

Type 63 is a very rare jar-type with a fairly long straight neck and hardly any rim at all. This type, if such it can be called, is represented by only three examples of variant shapes which are all illustrated. Variant 63*a* is of chalky-slipped coarse grey ware with a row of roughly incised impressions on the exterior of the lip, from an Arretine layer of the Northern Sector (AK V, 8N). Variant 63*b* has ridges on the neck and is of coarse greyish red fabric with pink slip outside from a pre-Arretine layer (AK II, 13). Variant 63*c* is distinguished by a groove below the neck and a ridge on the shoulder, and is of gritty greyish red fabric, from the Main Drain Phase of the Southern Sector.

Type 64 is the neck-fragment of a small jar with a rolled rim. It is invariably of a fine grey fabric, usually treated with black slip and is confined to the Southern Sector, where it occurs through all phases except the latest.

Type 65 is a jar with an incurved rim. This type is peculiar to the Southern Sector and is occasionally present throughout its occupation. It is invariably of a coarse greyish red fabric treated with red or haematite slip. Variant 65*a*, which is larger in size but of similar ware and provenance, occurs less frequently.

Type 66 is the neck-fragment of a large vessel with an inward thickening of the rim. It is of a coarse greyish buff fabric, treated with red slip, and comes from Pottery Group A (Early Phase) of the Southern Sector.

Type 67 is the upper part of a jar with a sharply everted and slightly concave rim. It is of a coarse greyish buff fabric and is represented by only two examples, of which one is from Pottery Group A (Early Phase) of the Southern Sector and the other from the unstratified French excavations.

Type 68 is an extremely rare jar-type with a wide mouth and out-turned rim, occurring sporadically throughout the occupation of the Northern Sector. It is invariably of a thick coarse grey fabric treated with chalky slip outside. Variant 68*a* shares the ware and provenance of the arch-type, from which it deviates slightly in shape.

Type 69 is a fairly large jar distinguished by a grooved or flanged rim. It is one of the minor types, confined to the Arretine and post-Arretine phases of the Northern Sector. The type is of a thick coarse fabric and is generally grey in the Arretine and red in the post-Arretine phase. Its shape below the shoulder is unknown. Variant 69*a* has an analogous shape but is smaller in size; it is peculiar to the post-Arretine phase. Variant 69*b*, of a chalky-slipped coarse grey fabric, comes from an Arretine layer (AK II, 7 Ar.). All other variants are of red-slipped coarse greyish red fabric and, save for 69*d* (from the Early Phase of the Southern Sector), belong to the post-Arretine period. Unlike the type and other variants, 69*c* and 69*e* are ornamented, the former with a row of applied cable and the latter with incised slanting strokes.

Type 70 is a very rare jar with a wide neck and thickened rim. It is of a shape similar to type 52 but is thicker and larger in size. This type is of a coarse fabric, treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine phase of the Northern Sector and all periods of the Southern. The same is applicable to variant 70*a*.

Type 71 is again a rare jar characterized by a thick rolled rim. This type occasionally occurs in the Arretine and post-Arretine phases of the Northern Sector and throughout the occupation in the Southern. It is of a thick coarse fabric, usually treated with slip outside, and is generally grey in the Arretine layers of the Northern Sector and red elsewhere. Variant 71*a*, of a gritty grey fabric, is peculiar to the pre-Arretine horizon of the Northern Sector, while variants 71*b-c*, of a red-slipped coarse greyish red fabric, are confined to the post-Arretine and Arretine phase respectively of the same Sector. The last variant, 71*d*, is a derivative of the type in gritty greyish red ware and comes from Pottery Group A (Early Phase) of the Southern Sector.



Type 72 represents a jar distinguished by a thick voluted rim. It is one of the minor types, occurring occasionally throughout the occupation of both Sectors. It is of a coarse fabric, usually treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variants 72a, 72c and 72f share the ware and distribution of the main type, while 72b occurs in chalky-slipped coarse grey or greyish buff ware and is peculiar to the Arretine and post-Arretine periods of the Northern Sector. Of the remaining variants, 72d is of a coarse grey fabric from a pre-Arretine layer (AK V, 9N), while 72f, of a coarse greyish red ware, is confined to an Arretine layer (AK II, 8 green).

Type 73 is a jar with a narrow high neck and thickened rim, resembling Type 53c. It is a rare type but occurs sporadically in the Arretine and post-Arretine phases of the Northern Sector and throughout the occupation of the Southern. It is of a thick coarse fabric, treated with slip outside, and is generally grey in the Arretine layers of the Northern Sector and red elsewhere. Variants 73a-b have shorter and broader necks than the arch-type, the former being of a gritty micaceous greyish red fabric from the post-Arretine phase of the Northern Sector, and the latter of haematite-slipped coarse greyish red ware from a mixed deposit (AK VIII, pit 1). Variant 73c is represented by a solitary example of a coarse grey fabric with chalky slip from the lowest Arretine layer (AK II, 8 green). Like most of the jar-types, its shape below the shoulder is unknown.

Types 74-75, both fragmentary, appear to be the upper and lower part respectively of the same type, but, until this is proved by the recovery of a complete section, it is better to regard them as different types. Type 74 represents the head of a large vessel distinguished by a narrow aperture and thick lip with an inward slope. The largest fragment, which is  $7\frac{1}{2}$  inches deep, shows a tendency to taper downwards. Type 75, on the other hand, is the lower part of a tall conical vessel tapering down to a point at the base which was obviously meant to be buried in the ground; indeed, many were found so buried (pl. XXXIII A). The largest fragment of the latter is 29 inches from point to break.

Types 74 and 75 are both characteristic shapes of the site and occur in fair profusion throughout the occupation of both Sectors. They are identical in ware, being of a thick coarse fabric which is generally grey in the pre-Arretine layers of the Northern Sector and greyish red with grey core elsewhere. Type 75 has no slip at all, while Type 74 occasionally has a slip which is invariably confined to the portion above the shoulder. While Type 74 is completely wheel-turned, a remarkable feature of Type 75 is that it is hand-made up to a certain height from the base, above which it is wheel-turned. Put together, the two types would constitute a tall conical vessel, upwards of 35 inches high, which presumably functioned as a container of wine or oil like the imported amphorae, to which it bears a partial affinity. It may be noted that a group of eight jars of this type, some fitted into the broken remains of others, were found within an area of four square feet in a deep level of AK I of the Southern Sector.

Variants 74a-d are as common and widely distributed as the main type, from which they deviate very slightly in the form of the lip. Variant 74e, with an unusually pronounced beak, is confined to Pottery Group A (Early Phase) of the Southern Sector, while 74f, characterized by a multi-faceted lip, and 74g-h by drooping lips, are peculiar to the pre-Arretine layers of the Northern Sector. Variants 74i-l show relatively wider mouths, and all save the last are distinguished by thick clubbed lips. Of these, 74i is peculiar to the pre-Arretine and 74j-l to the post-Arretine phase of the Northern Sector. Variant 74m is a diminutive of this type and occurs fairly frequently throughout the occupation of both Sectors.

Variants of Type 75 may be distinguished by a slight diversity of base-forms. Variants 75a-b, distinguished by solid and more pointed base-forms, are peculiar to the Main Drain Phase of the Southern Sector, while 75c is a unique variant with a flat base from an unstratified deposit of the Southern Sector (AK I).

Type 76 is the largest storage-jar of Arikamedu, with a thick out-turned rim. It occasionally occurs throughout the occupation of both Sectors. Its fabric is thick and coarse, treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variant 76a, distinguished by ridges on the shoulder and a slightly different rim-form, shares the range of fabric and distribution of the arch-type.

Type 77 is a somewhat smaller jar than Type 76 and is distinguished by an out-turned rim and more drooping profile. It is confined to the Southern Sector and occurs occasionally throughout its occupation. It is invariably of a thick coarse greyish red fabric, which is rarely treated with slip.

Type 78 is a large jar-type characterized by thick ware and a heavy roll rim. It occasionally occurs in the post-Arretine phase of the Northern Sector and throughout the occupation of the Southern. It is invariably of a coarse greyish red fabric with grey core, and is treated with red slip on the exterior.



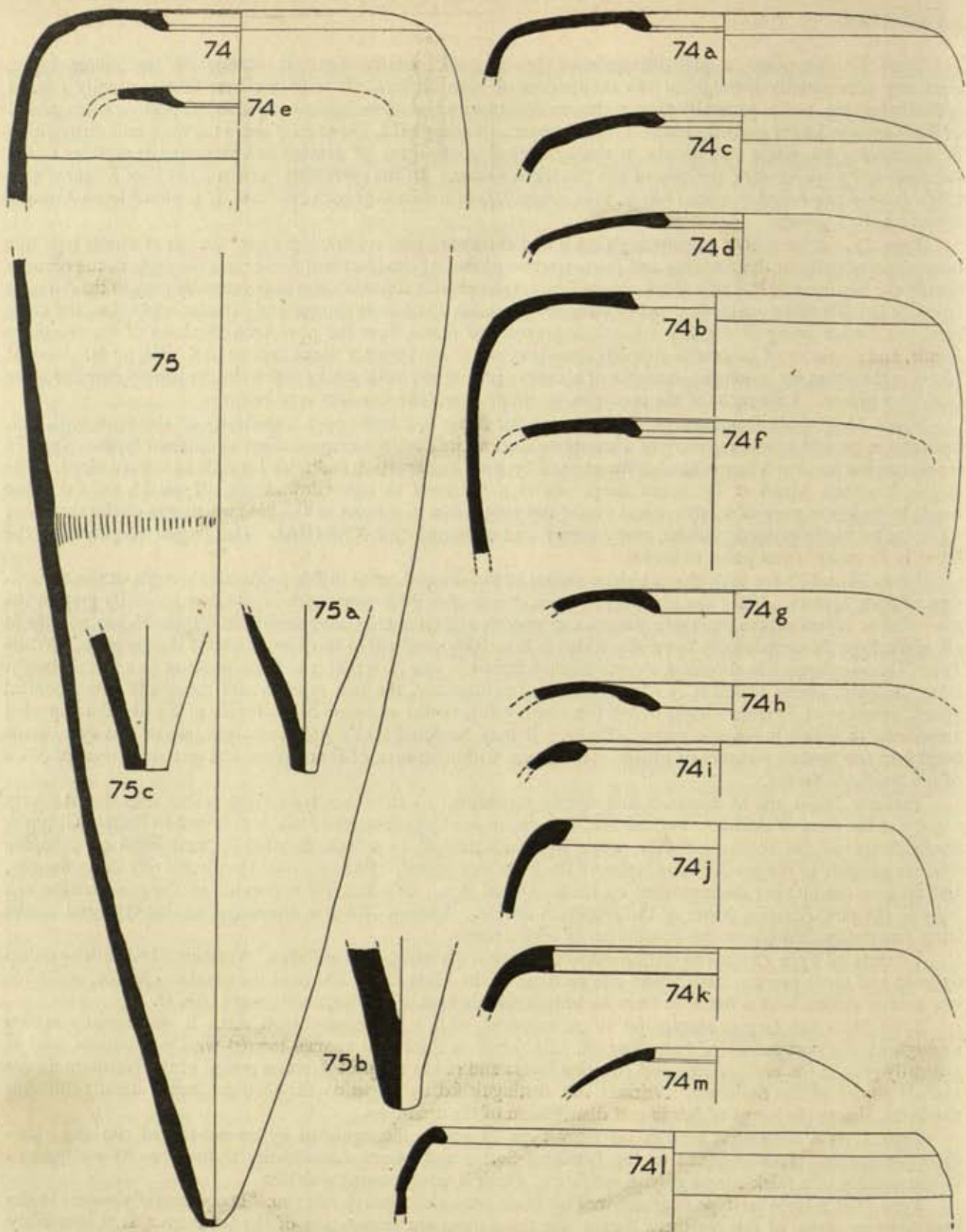


FIG. 29. Types 74-75.  $\frac{1}{2}$



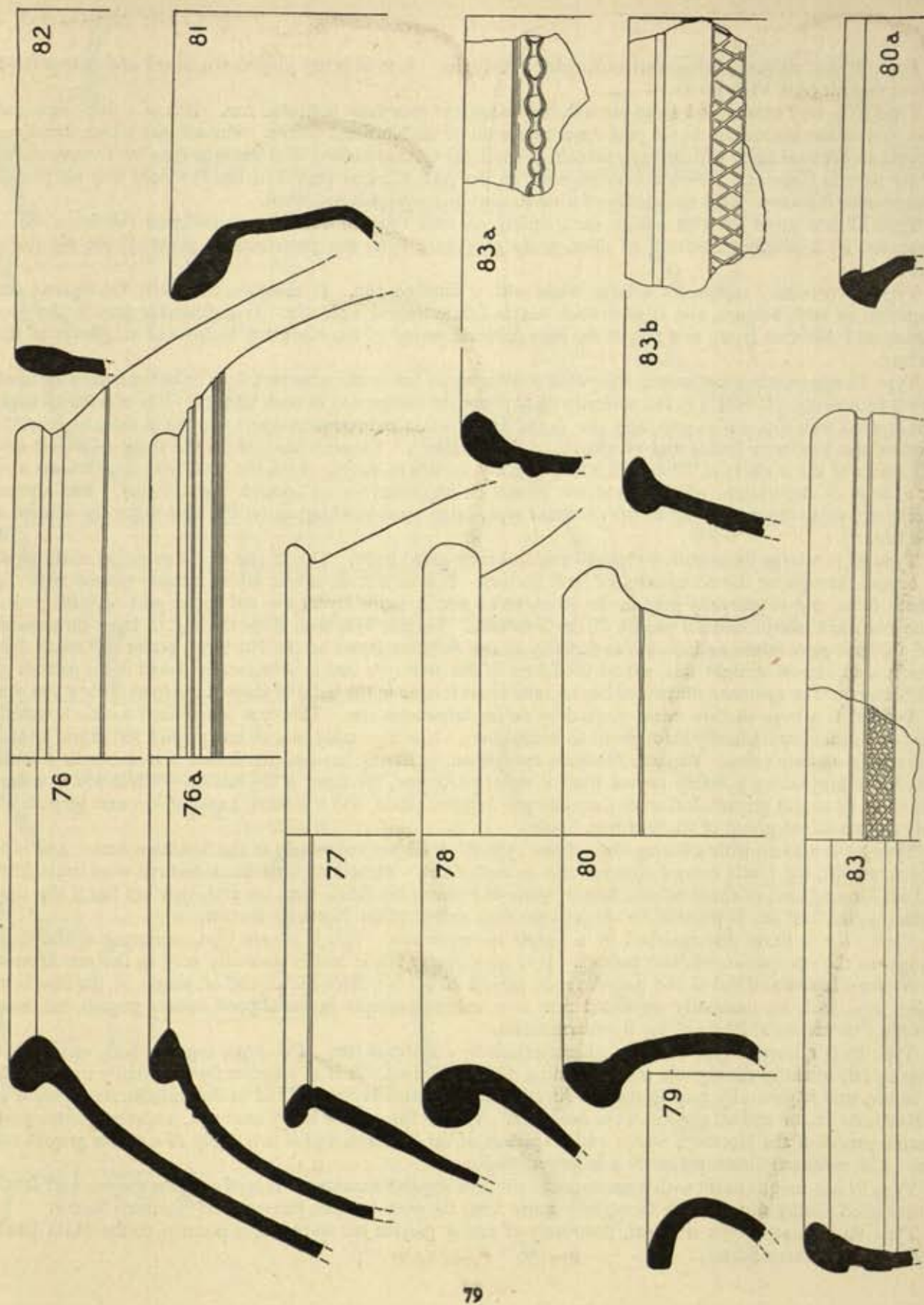


FIG. 30. Types 76-83. †



Type 79 is a unique jar-fragment with thick flaring rim. It is of gritty greyish red fabric and comes from a mixed deposit (AK VIII, pit 1).

Type 80 is very rare; it is a large jar with high neck and internally hollowed rim. It is of a thick light-red fabric, and occurs exclusively in the post-Arretine period of the Northern Sector. Variant 80a, which combines in its rim an external beak with an internal roll, is relatively more abundant than the arch-type but is represented only by minute fragments; it occurs occasionally in the post-Arretine period of the Northern and all phases of the Southern Sector. It is invariably of a micaceous gritty greyish buff ware.

Type 81 is a large jar with a high neck analogous with Type 80 but shows a different rim-form. It is represented by a solitary specimen of thick gritty grey ware from the post-Arretine phase of the Northern Sector.

Type 82 probably represents a large basin with a clubbed rim. It occurs occasionally throughout the occupation of both Sectors, and is of a thick coarse fabric treated with slip. It is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern.

Type 83 apparently represents a somewhat similar vessel but is characterized by a raised ornamented band below a heavy rim. It occurs in fair quantity throughout the occupation of both Sectors. It is of a thick coarse fabric treated with slip, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variants 83a-b share the range of fabric and distribution of the main type, from which they slightly deviate in shape. Like the arch-type, the variants also bear a band of decoration, which was either incised or impressed on an applied band of clay. The normal patterns are close cross-hatching as on the main type, large cross-hatching as on 83b and finger-tip ornament as on 83a.

Type 84 is a large basin with a clubbed rim and corrugated body. This is one of the principal basin-types and occurs throughout the occupation of both Sectors. It is of a thick coarse fabric, usually treated with slip on both faces, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variant 84a, with sides tending to taper downward, is of a coarse grey fabric and occurs exclusively in the Arretine layers of the Northern Sector. Variant 84b, which has an almost straight side, shares the fabric of the arch-type and is occasionally found in all periods of both Sectors. The specimen illustrated has an individual feature in the band of slashed ornament below the rim.

Type 85 is a large shallow basin marked by an inconspicuous rim. This type is confined to the Southern Sector and occurs sporadically throughout its occupation. It is invariably of a coarse greyish red fabric treated with red slip on both sides. Variants 85a-b are exceptional in having handles, the former a loop-handle flanked by nail-like projections possibly copied from a metal prototype, the latter a lug-handle. While 85a is a fair-sized basin of coarse greyish buff ware from the pre-Arretine phase, 85b is a small basin of a coarse greyish red fabric from a mixed group of the Southern Sector.

Type 86 is a basin with a flaring rim. Like Type 85, it occurs exclusively in the Southern Sector and is of a coarse greyish red fabric treated with red slip on both faces. Variant 86a is a black-and-red ware basin from the Late Drain Phase of the Southern Sector, while 86b shares the fabric with the arch-type but has a slip only on the interior face and is peculiar to the post-Arretine period of the Northern Sector.

Type 87 is a basin distinguished by a simple incurved rim. This is a rare type, occurring sporadically throughout the occupation of both Sectors. It is of a coarse fabric and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variant 87a, with an internally expanded rim, is a unique example in red-slipped coarse greyish red ware from the Pre-structural Phase of the Southern Sector.

Type 88 is a normal type of basin, characterized by a clubbed rim. This type, together with variant 88a, occurs in fair quantity throughout the occupation of both Sectors. It is of a coarse fabric, usually treated with slip inside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variant 88b, with a heavy bead-rim, is confined to the post-Arretine period of the Northern Sector and all phases of the Southern and is invariably of a coarse greyish red ware. The specimen illustrated bears a large perforation.

Type 89 is a unique basin with a pronounced rim and angular shoulder. It is of a coarse greyish buff fabric with polished chalky slip on both faces, and comes from the post-Arretine phase of the Northern Sector.

Type 90 is a rare type of bowl, invariably of coarse greyish red ware. It is peculiar to the Main Drain Phase of the Southern Sector.



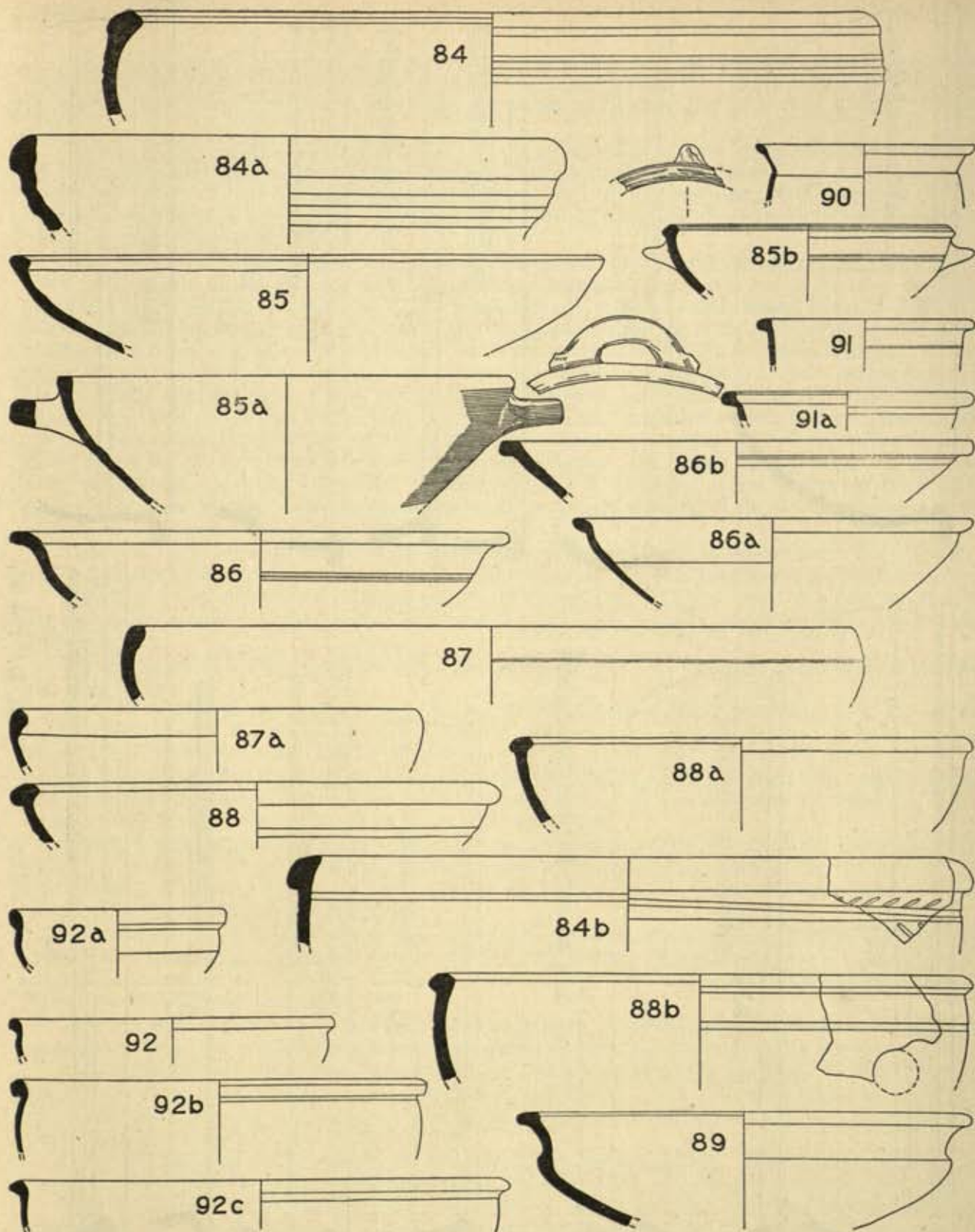


FIG. 31. Types 84-92.  $\frac{1}{4}$



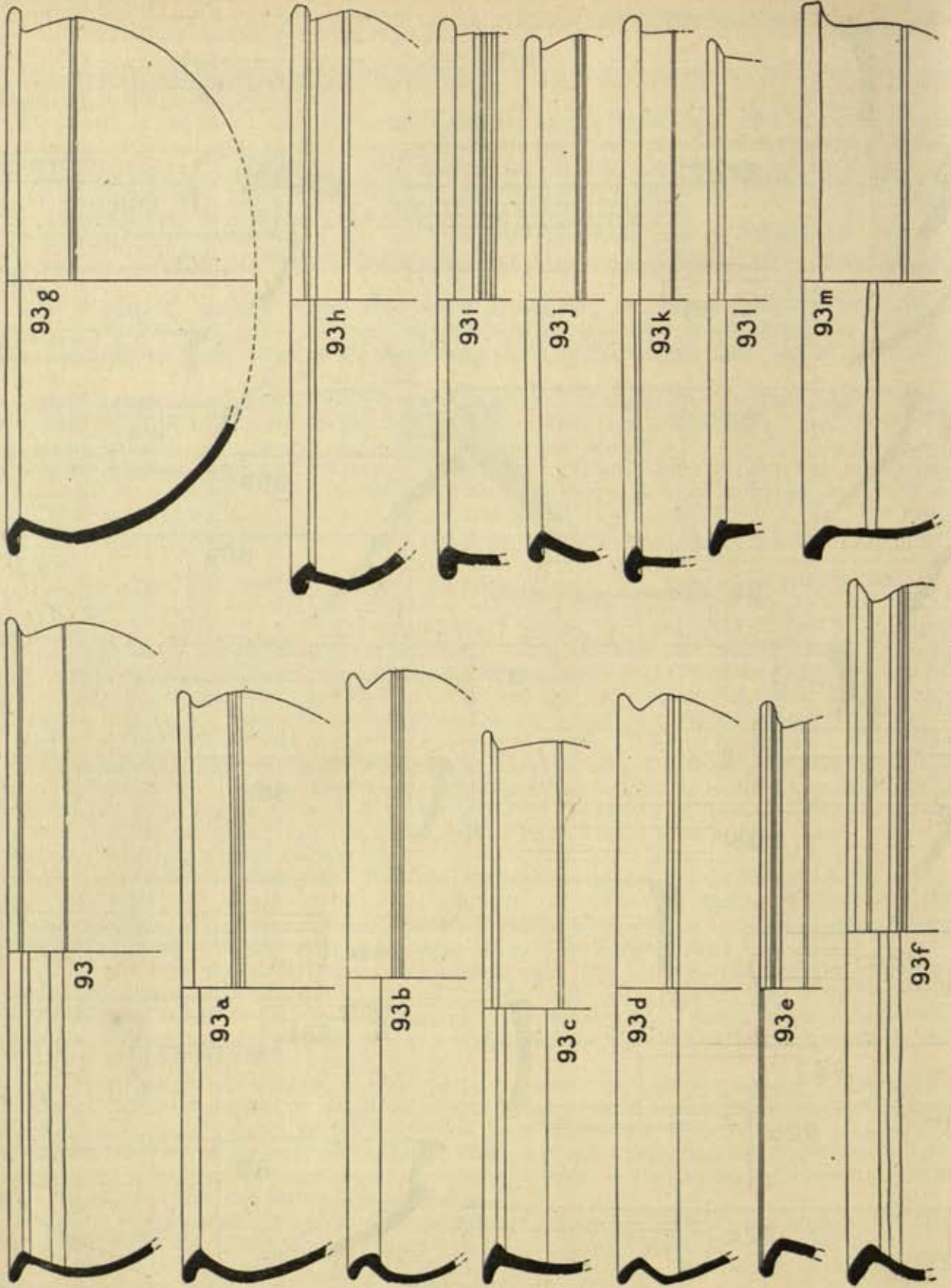


FIG. 32. Type 93. 1



Type 91 is a bowl distinguished by an internally hollowed thick rim. It is characteristic of the Southern Sector and occasionally occurs throughout its occupation. It is invariably of a coarse greyish red fabric, with red slip inside. Variant 91a shares the fabric and provenance of the arch-type, from which it slightly deviates in shape.

Type 92 is a bowl with a thickened or rolled rim. It occurs in fair quantity in the post-Arretine phase of the Northern Sector and throughout the occupation of the Southern. It is normally of a red-slipped coarse greyish red fabric. Variant 92a shows a cavity in section where the rim has been rolled; it is from the Pre-structural Phase of the Southern Sector. Variants 92b-c share the fabric and provenance of the arch-type, from which they slightly deviate in rim-form.

Type 93 is the commonest shape of basin and is distinguished by a flanged rim like that of Type 21, wide mouth and rounded base. It is one of the characteristic shapes of Arikamedu and is found in profusion throughout the occupation of both Sectors. The type is of a coarse fabric, usually treated with slip both inside and out, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variants 93a-c show very slight deviations in shape. Variant 93d is of a coarse reddish fabric and is a unique piece from the post-Arretine phase of the Northern Sector; it has a carinated shoulder, and is treated with pinkish chalky slip on both sides. Variant 93f with a thickened rim and 93g-j with curved rims occasionally occur throughout the occupation of both Sectors. Variants 93e and 93m, both of a red-slipped coarse greyish red fabric, are unique examples respectively from Pottery Group A (Early Phase) and the Pre-Structural Phase of the Southern Sector. The former has a grooved rim, while the latter shows a rim resembling a golf-club. Variants 93k-l, of a red-slipped coarse greyish red fabric, have distinctive hammer rims, the former being peculiar to the post-Arretine period of the Northern Sector and the latter to the Late Drain Phase of the Southern.

Type 94 is a large carinated basin with a distinctive grooved rim and ridges on the shoulder. It is of a coarse reddish grey fabric with a chalky wash, and occurs exclusively in the post-Arretine phase of the Northern Sector.

Type 95 is a large bowl with a thickened rim, almost straight side and sagger base. It occurs occasionally throughout the occupation of the Southern Sector and is invariably of a coarse greyish red fabric with red slip inside and out.

Type 96 represents a similar bowl but with a pronounced flat rim. Its fabric and distribution are identical with those of Type 95.

Type 97 is a bowl distinguished by a bulbous profile and pronounced bead-rim. It is one of the characteristic types of the site and occurs throughout the occupation of both Sectors. It is of a coarse fabric, treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variants 97a-d slightly deviate from the arch-type in shape, while 97e has the same profile as the arch-type but shows a clubbed rim and is confined to the Southern Sector through all phases of its occupation.

Type 98 is a larger bowl than Types 95-97 and is characterized by a thick out-turned rim and multi-ridged profile. It is rare but occurs sporadically in the Arretine and post-Arretine phases of the Northern Sector. It is invariably of a coarse greyish red fabric with red slip on both faces. Variant 98a has a more emphatic rim and is peculiar to the post-Arretine period.

Type 99 is a large bowl with an oblique rim. It is a rare type but occurs sporadically throughout the occupation of both Sectors. It is of a coarse fabric, treated with slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variant 99a has a slightly more everted rim.

Type 100, with a concave upper profile and grooved shoulder, occurs exclusively in the Arretine layers of the Northern Sector and is invariably of a coarse grey fabric with polished brownish chalky slip inside and out.

Type 101 is a bowl characterized by an everted rim and a rounded profile and base. It is the principal type of bowl and is found throughout the occupation of both Sectors. It is of a coarse fabric, treated with a slip outside, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern.

Type 102 is the upper part of a small bowl with a flaring rim and straight side. This is a rare type, occurring sporadically throughout the occupation of both Sectors, and is invariably of a fine grey fabric with black slip.

Type 103 is a bowl with a thickened and out-turned rim. It is a rare type, occurring sporadically in the Arretine and post-Arretine phases of the Northern Sector and throughout the occupation of Southern. It is of a coarse fabric, treated with slip both inside and out, and is generally grey in the Arretine phase and red



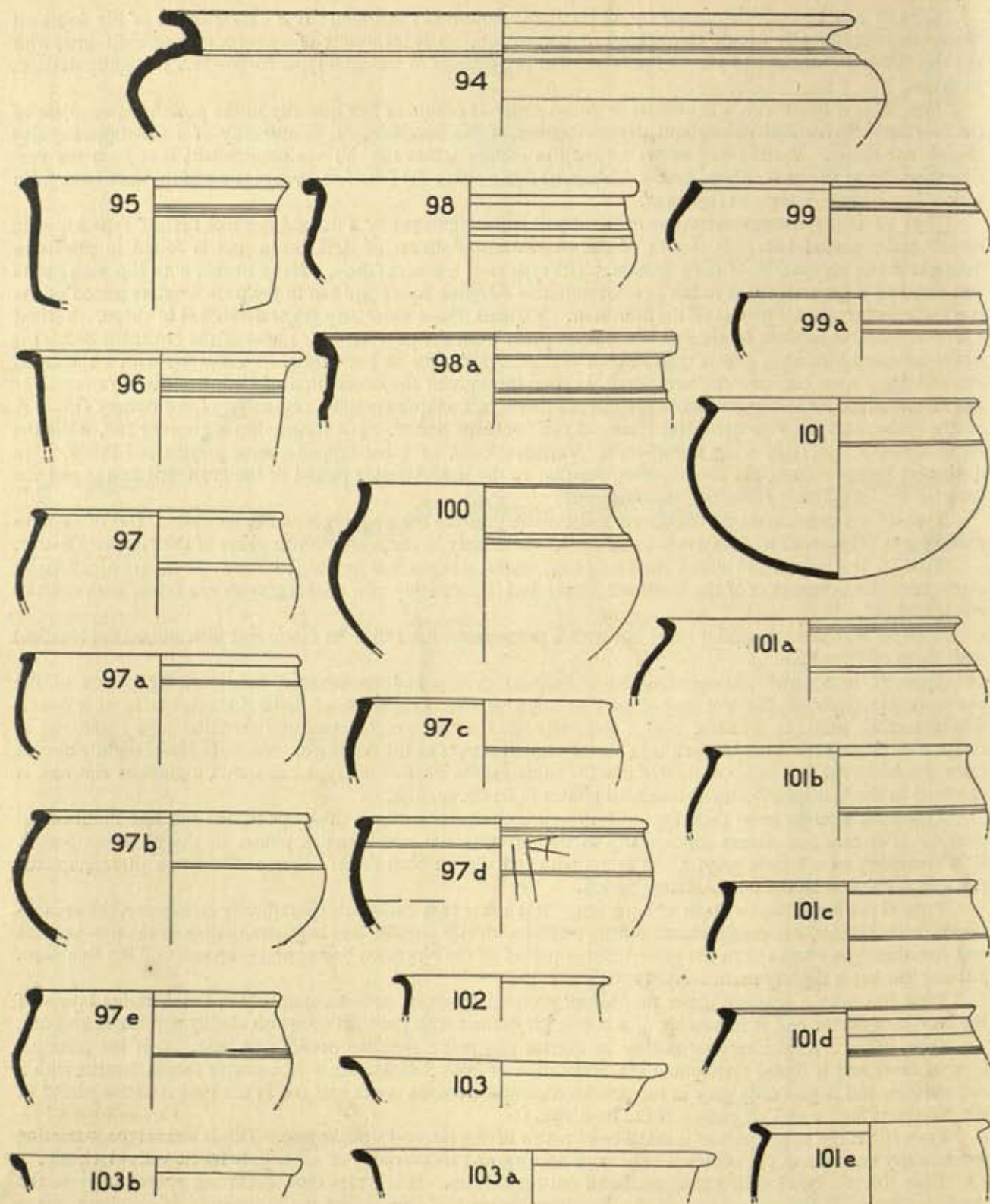


FIG. 33. Types 94-103.  $\frac{1}{4}$



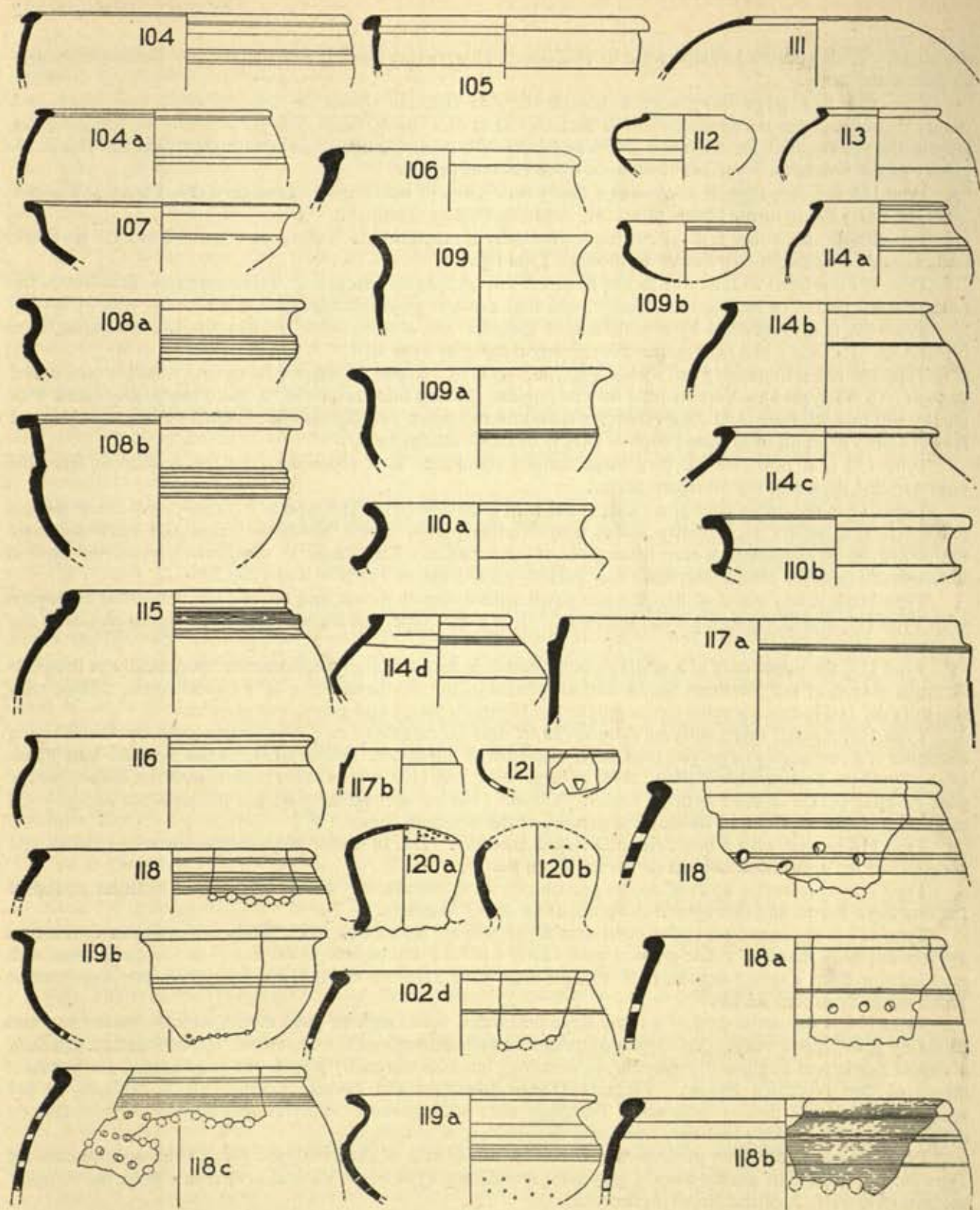


FIG. 34. Types 104-121.  $\frac{1}{4}$



elsewhere. It also occurs in black ware or black-and-red ware (i.e. black inside and red outside) due obviously to differential firing.

Type 104 is a large bowl with a hammer-headed rim. It is one of the principal bowl-types and occurs throughout the occupation of both Sectors. It is of a coarse fabric, treated with slip, and is generally grey in the pre-Arretine and Arretine layers and red in the post-Arretine period of the Northern Sector and all phases of the Southern. Variant 104a has a more bulbous profile.

Type 105 is a rare type of bowl with a heavy rim. It is of red-slipped coarse greyish red ware and comes from the Early Phase of the Southern Sector, including Pottery Group A.

Type 106 is also a rare type, occurring sporadically throughout the occupation of both Sectors. Its fabric and range of distribution are similar to those of Type 104.

Type 107 is a bowl with an out-turned flattened rim and angular shoulder. It is a rare type, confined to the post-Arretine period of the Northern Sector, and is of a coarse greyish red fabric.

Type 108 is distinguished by a multi-ridged shoulder and is represented only by the two specimens, here illustrated. Its fabric and provenance are similar to those of Type 107.

Type 109 is a shouldered bowl with a high rim. It is of a coarse greyish red fabric and comes from a mixed deposit (AK VIII, pit 1). Variant 109a with an angular grooved body is unique; it is of a coarse grey fabric with chalky slip on both faces, and comes from the same mixed deposit. A tiny variant of 109a, of a coarse greyish red fabric, comes from an unstratified deposit (AK I) of the Southern Sector.

Type 110 is a bowl with a prominent flanged shoulder. It is represented by two specimens from the post-Arretine period of the Northern Sector.

Type 111 is the upper part of a small vessel with a beaded rim. The type is invariably of a coarse greyish red fabric and occurs occasionally in the post-Arretine period of the Northern Sector and relatively more frequently in the Southern Sector throughout its occupation. The shape of the lower part of the type is unknown, though the extant fragments bear partial resemblance to Types 74 and 112-13.

Type 112 is a tiny vessel of flat globular shape with a narrow mouth and beaded rim, somewhat analogous with Type 111, and of a coarse greyish red fabric. It is a rare type, but occurs sporadically in all phases of the Southern Sector.

Type 113, the upper part of a small globular vessel, is another rare type, occurring sporadically in the post-Arretine period of the Northern Sector and all phases of the Southern. It is of a coarse fabric, treated with slip outside, and is either greyish red or grey in the Northern Sector and greyish red elsewhere.

Type 114, a small vessel with an oblique rim, is also an extremely rare type, represented by four varying examples of a coarse grey or greyish red fabric, which are all illustrated. Variant 114a comes from the Late Phase of the Southern Sector, while variant 114b, of larger size, and 114c, with a more pronounced rim, belong to the post-Arretine period of the Northern Sector. Variant 114d has an angular profile, a flattened rim and grooved shoulder. It comes from an unstratified deposit of the Southern Sector.

Type 115 is a jar with a blunt rim and ridged shoulder. It is of coarse greyish red ware with red slip, and comes from an unstratified deposit of the Southern Sector.

Type 116 represents a bowl of coarse greyish red ware, occasionally found in the post-Arretine period of the Northern Sector and throughout the occupation of the Southern.

Type 117 is the upper part of a bowl with a rim rebated for receiving lid. Only two examples of this type are known, both made of a fine-grained pink fabric with red slip outside. Variant 117a is a large bowl with grey interior from a mixed deposit (AK VII, pit 2A), while 117b is a small brittle bowl from the post-Arretine phase of the Northern Sector.

Type 118 is the upper part of a fairly large perforated vessel with an open mouth, bluntly beaked rim and probably pear-shaped body. This type occurs sporadically throughout the occupation of both Sectors. It is of a coarse fabric and is generally greyish red in colour but is occasionally grey in the pre-Arretine and Arretine layers of the Northern Sector. Variants 118a-e illustrate the range of type. It is difficult to say what the function of these vessels was. That they were not heaters is clear from the absence of soot-stain on their exterior. It is likely that they were used as colanders or strainers.

Type 119 represents other perforated vessels, of which 119a is of chalky-slipped greyish buff ware resembling Type 24, and 119b is of chalky-slipped grey ware resembling Type 101. Variant 119b comes from the Arretine horizon (AK VIII, 5) of the Northern Sector.

Type 120 is a perforated vessel bearing partial affinity in shape to lid-types 34-35. It is represented by only two fragmentary examples, of which 120a is of a greyish buff fabric with pinkish chalky slip from the



unstratified French excavations, and 120*b* is black-slipped coarse grey ware from a pre-Arretine layer of the Northern Sector (AK V, 11A).

Type 121 is a unique haematite-slipped greyish red-ware bowl resembling Type 8*k*, with large triangular perforations in the base, and comes from the Late Drain Phase of the Southern Sector.

Type 122 is the upper part of a large jar decorated on the shoulder with two bands of alternating nicked and finger-tip pattern. It is of a coarse red fabric with a distinctive polished bright red slip outside and comes from the disturbed area of AK I in the Southern Sector. Variant 122*a* is of smaller size but has the same provenance. Similar ware distinguishes a fairly large class of vessels (comprising Types 123-34) characterized also by grooved rims.

Type 123 is the upper part of a unique ornamented *ghafa* (water-vessel) with an externally grooved rim. It bears on the shoulder a band of stamped concentric circles and another of incised oblique strokes. Its ware and provenance are similar to those of Type 122.

Type 124 is the upper part of a jar with a distinctive internally grooved and flanged rim. It is of a coarse greyish red fabric which is usually treated with bright red slip but in one case with yellowish red slip. It is a rare type, confined to the Late Drain and Late Phases of the Southern Sector. Variant 124*a* is represented by a solitary specimen from the post-Arretine phase of the Northern Sector.

Type 125 is the upper part of a large jar with a rim having one external and many internal grooves, which also occur on the exterior of the shoulder. It is of a coarse greyish red fabric, treated with red slip outside, and is represented by only two examples, of which one is unstratified, and the other comes from the Late Phase of the Southern Sector.

Type 126 is a pot with an angular profile and an externally grooved rim, represented by only two examples, one unstratified and the other from the Early Phase of the Southern Sector. It is of a coarse greyish red fabric painted with red slip outside. From their soot-stained exterior it is evident that these vessels functioned as cooking-vessels. Variant 126*a* with a rim thicker than that of the arch-type is a solitary fragment from the post-Arretine phase of the Northern Sector.

Type 127 is a carinated vessel with a grooved rim. It is of a fabric identical with that of Type 126. It occurs sporadically in the post-Arretine period of the Northern Sector and all phases of the Southern. Variant 127*a*, with a sharper carination, comes from an unstratified deposit, while 127*b* is represented by only two examples, one from a mixed deposit of the Northern Sector (AK II, pit 3) and the other from the Late Phase of the Southern.

Type 128 is the neck-fragment of a unique vessel with a broad rim having one external and numerous internal grooves. It is too fragmentary to show the shape of the body. It is of a coarse red fabric with burnished bright red slip and comes from the disturbed area of AK I in the Southern Sector.

Type 129 represents the fragmentary narrow neck of a jar with an externally grooved rim. It is a unique specimen from the Pre-structural Phase of the Southern Sector and is of a red-slipped coarse greyish red ware.

Type 130 is the fragmentary narrow neck of a jar with a rim having an internal and external groove. It is of a coarse greyish red fabric treated with red slip and occurs sporadically in the post-Arretine period of the Northern Sector and in unstratified deposits of the Southern.

Type 131 is a fragment of a unique jar with a grooved rim. It is of a red-slipped coarse greyish red fabric and comes from the post-Arretine period of the Northern Sector.

Type 132 represents the upper part of a unique bowl having an externally grooved rim. It is of a red-slipped coarse greyish red fabric and comes from the Early Phase of the Southern Sector.

Type 133 is the rim fragment of a jar showing an external groove. It is a unique piece, of light red ware, and comes from the Late Drain Phase of the Southern Sector.

Type 134 is the upper part of a jar with an externally grooved rim. From the fragmentary tapering profile it appears to have had a base resembling Type 138, but this possibility cannot be stressed. It is of a coarse greyish-red fabric with haematite slip, and comes from the post-Arretine phase of the Northern Sector.

Type 135 is the upper part of a jar with a profile similar to that of Type 134 but with a grooveless rim. Its shape is analogous with that of Type 118 which, however, belongs to the perforated class of vessels. It is of coarse greyish red ware with haematite slip, and occurs rarely in the post-Arretine period of the Northern Sector. The specimen illustrated has an individual feature in bearing an incised zigzag ornament.

Type 136 is the upper part of a basin decorated with two rows of incised zigzag below its thick hammer-head rim. It is a unique piece, in coarse greyish red ware, and comes from the Late Phase of the Southern Sector.



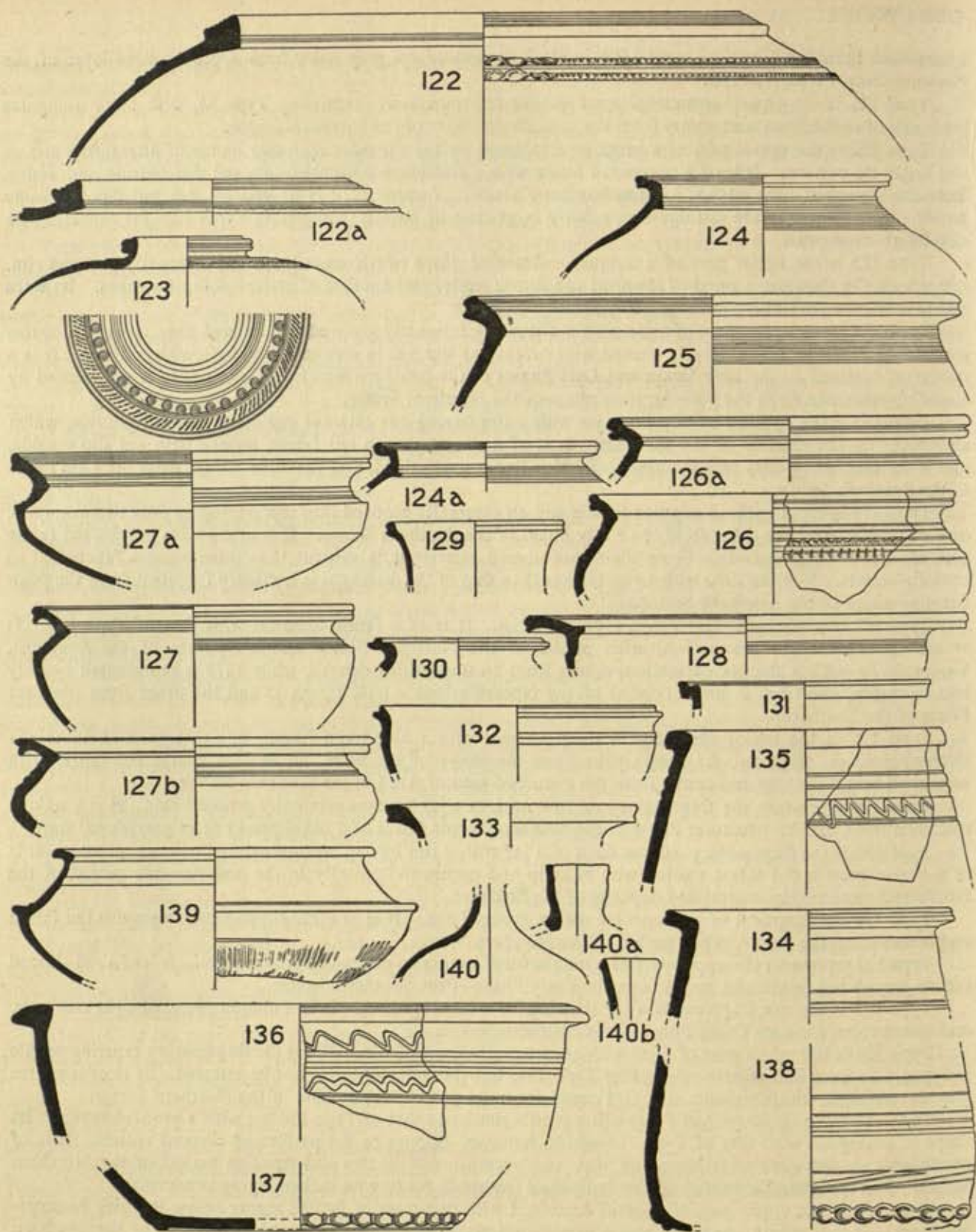


FIG. 35. Types 122-140.  $\frac{1}{4}$



Type 137 is a fragment probably of a basin. It is of a gritty greyish red ware, and occurs rarely in the Late Phase of the Southern Sector. It invariably bears a row of applied finger-tip ornament just above the base.

Type 138 is the lower portion of a vessel possibly of Type 134. Like Type 137, it is of a gritty greyish red ware and always has a band of applied finger-tip ornament. It is a rare type, occurring sporadically in the Late Drain and Late Phases of the Southern Sector.

Type 139 represents a unique carinated vessel with a basket-impressed base. With a soot-stained exterior it was evidently a cooking vessel. It is of red-slipped thin light red ware and comes from Pottery Group A (Early Phase) of the Southern Sector.

Type 140 represents the upper part of a small bottle-necked vessel. It is a very rare type, confined to the pre-Arretine and Arretine layers of the Northern Sector. It is of a coarse fabric and occurs both in grey and red wares, the former being covered with bluish chalky slip and the latter with haematite slip. The actual bottle-neck is represented by 140a-b, the former coming from the pre-Arretine and the latter from the Arretine phase.

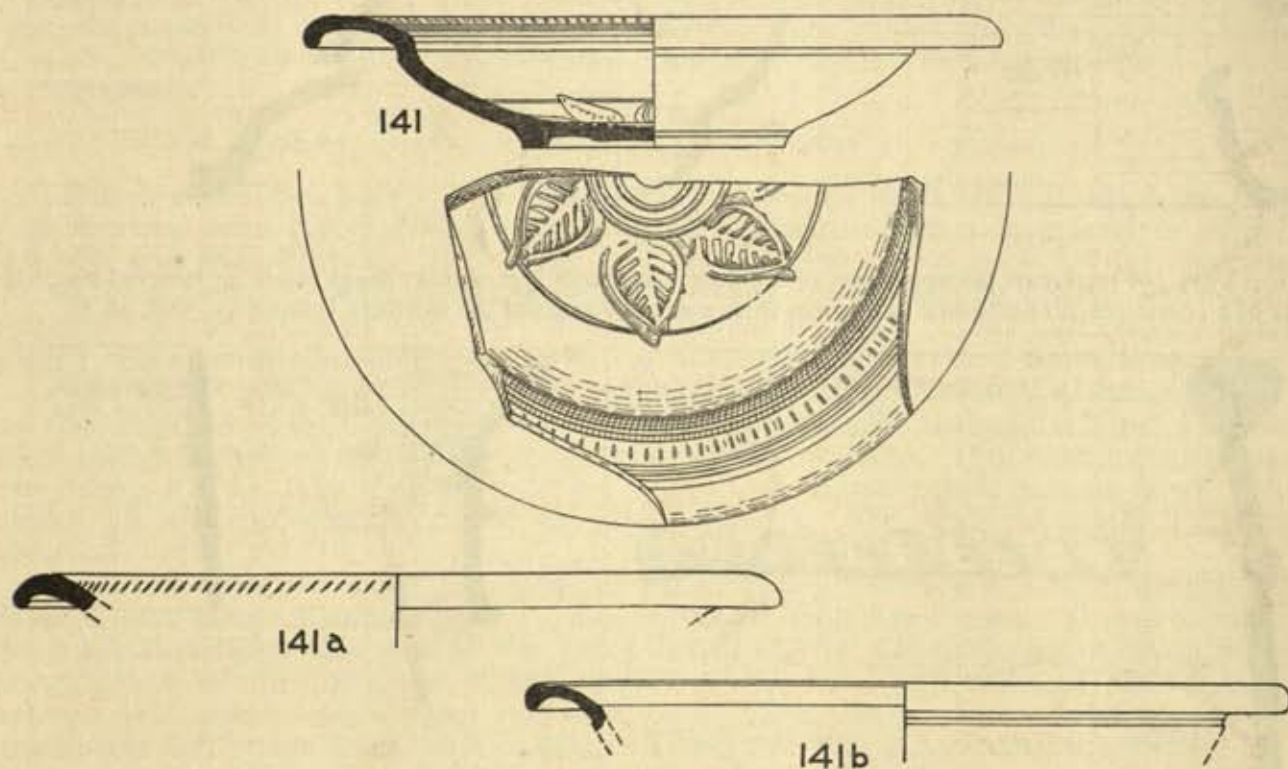


FIG. 36. Type 141.  $\frac{1}{2}$

Type 141 is a rare type of dish with a flaring rim and a foot-ring, and is ornamented on the interior face with a row of nicks at the rim and a stamped floral pattern on the base. It is of a fine grey fabric and occurs sporadically in the Arretine and post-Arretine layers of the Northern Sector and throughout the occupation of the Southern. Variant 141a comes from the Arretine layers, while 141b is peculiar to the post-Arretine phase of the Northern Sector.

Type 142 represents the hollow pedestal base of a pot, the full shape of which is unknown. It is invariably of coarse greyish red ware and occurs occasionally in the post-Arretine period of the Northern Sector and throughout the occupation of the Southern. The specimen illustrated has an individual feature in a row of slashed decoration both on the exterior and the interior and comes from Pottery Group A (Early Phase) of the Southern Sector. Variants 142a-b come from the post-Arretine phase of the Northern Sector, while 142c comes from a disturbed deposit of the Southern.

Type 143 apparently represents the bluntly pointed base of a large storage jar. It is of a thick coarse fabric, and occurs occasionally throughout the occupation of both Sectors. It is generally grey in the pre-Arretine



layers and red elsewhere. Variant 143a is confined to the post-Arretine period of the Northern Sector, while 143b-c are peculiar to the Southern Sector and occur occasionally through all its phases. Variant 143d is a unique specimen of a coarse grey fabric from the pre-Arretine phase of the Northern Sector.

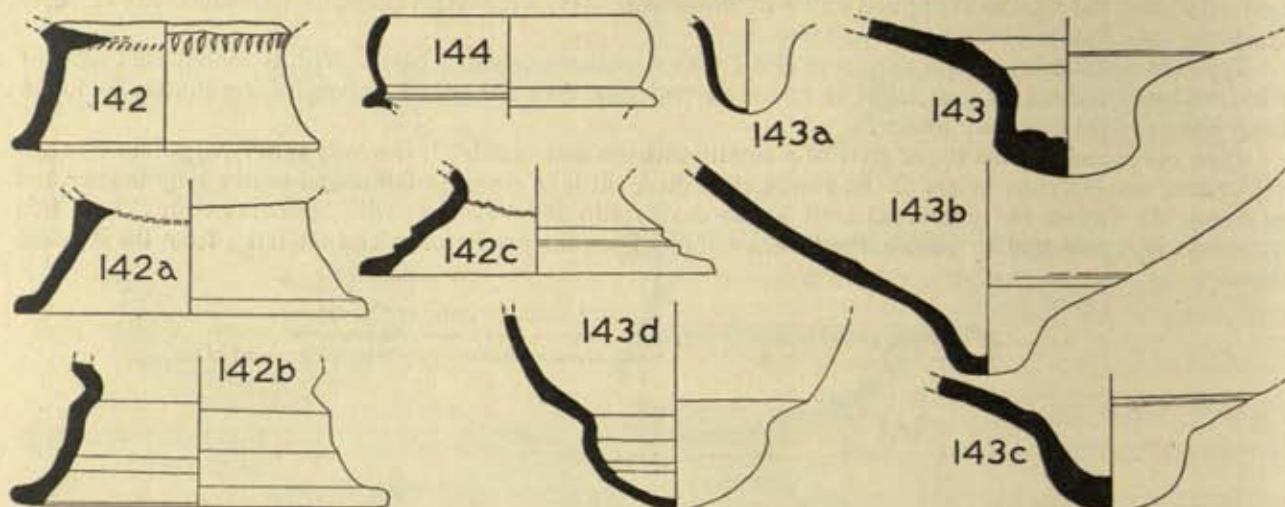
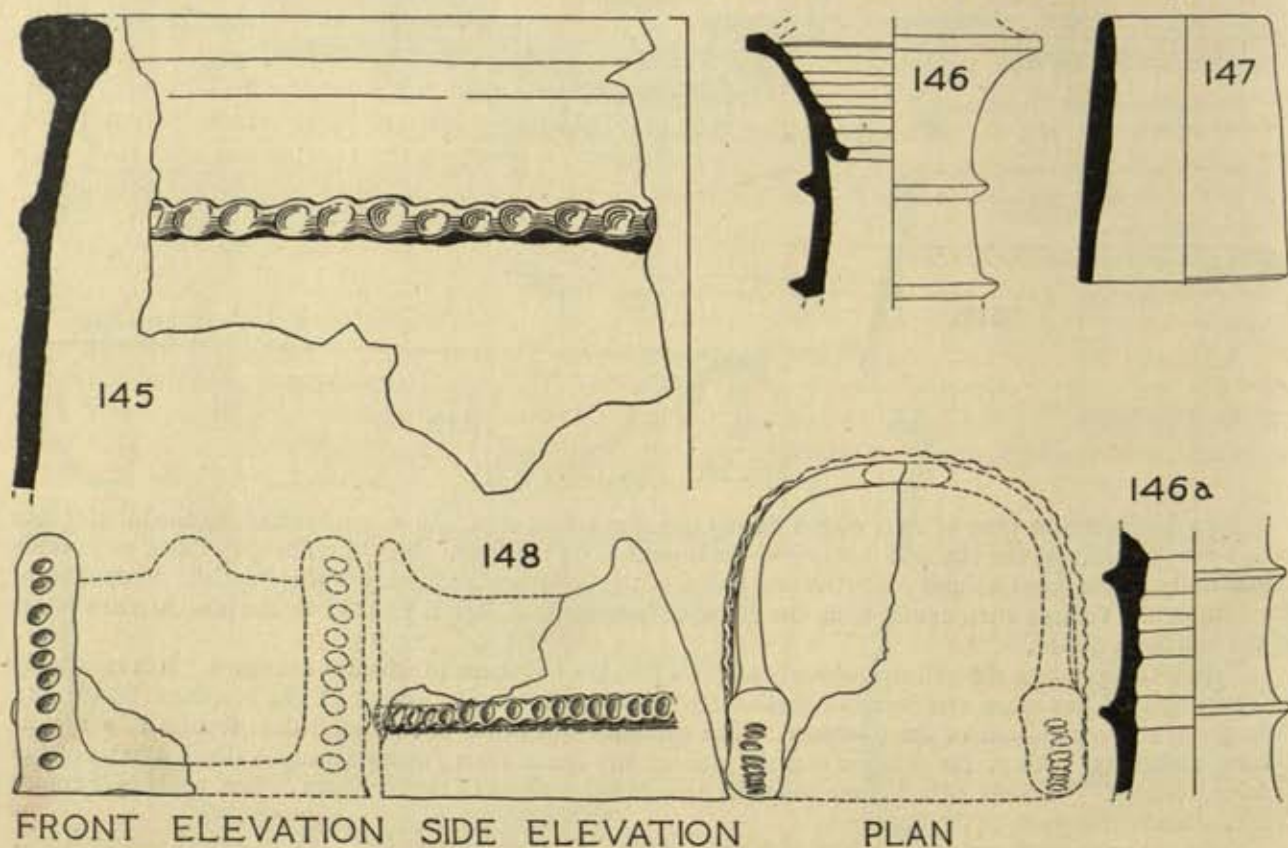


FIG. 37. Types 142-144.  $\frac{1}{4}$

Type 144 represents the upper part of a unique vessel with a prominent flange below an incurved rim. It is of a coarse greyish buff fabric and comes from a mixed deposit of the Northern Sector (AK VIII, pit 1).



FRONT ELEVATION SIDE ELEVATION PLAN

FIG. 38. Types 145-148.  $\frac{1}{4}$



Type 145 represents the top apparently of a large storage-jar. It is hand-made, of a thick coarse fabric which is generally grey in colour in the pre-Arretine and Arretine layers of the Northern Sector and greyish red elsewhere. It bears an applied band of finger-tip ornament. The type occurs throughout the occupation of both Sectors. In one instance the upper part of a vessel of this type was used as the top ring of a 'ring-well' or soak-pit.

Type 146 is a fragment probably of a finial, with numerous flanges. It is of a coarse fabric, generally grey in the pre-Arretine and Arretine layers of the Northern Sector and red elsewhere. The majority of its examples are made of two sections which are subsequently luted together, while a few (variant 146a) are potted in a single operation. It occurs occasionally throughout the occupation of both Sectors.

Type 147 is a cylindrical pipe of uncertain use. It is of coarse greyish buff ware, and occurs sporadically in the Arretine and post-Arretine phases of the Northern Sector.

Type 148 is a portable hand-made oven of horse-shoe plan. The type is invariably decorated with an applied band of finger-tip ornament on the exterior and a row of finger-nail impressions or punched circlets on the flanges of the opening. It is of a thick coarse fabric and is usually grey in the pre-Arretine and Arretine layers and greyish red in the post-Arretine period of the Northern Sector and throughout the occupation in the Southern. Normally it is of a crude workmanship but sometimes its exterior is smoothed and slipped.

### C. CHINESE CELADON WARE

Sherds of celadon ware can be picked up occasionally upon the surface of the site, and fourteen were found during the excavation. These occurred invariably in mixed deposits and spoil-trenches. It is likely that the numerous *Colā* coins, of the eleventh or adjacent centuries A.D., found previously should be ascribed to similar superficial deposits, as was a copper coin of this period found in 1945. Coins and pottery alike clearly relate, not to the occupation of the site, but to its spoliation in the middle ages.

The ware is greyish white in section but assumes a dull pink surface where (generally on the underside of the base) it has been exposed directly to the heat of the kiln. For the most part it is covered with a jade green glaze, usually crackled. (For chemical analysis, see below, p. 94.) The shapes, so far as they can be reconstructed, indicate bowls and dishes, all with foot-rings, to one of which sand adheres. The bowls are usually fluted or dimpled.

Celadon ware was made principally in the Chekiang province of China, notably at Yüeh Chou, Lung-Ch'üan and Ch'u Chou, where its kilns are known. It was already in production before the end of the T'ang dynasty (A.D. 618-906), but it is specially characteristic of the Sung and Yüan dynasties (A.D. 960-1368) when its manufacture centred first round Lung-Ch'üan and later round Ch'u Chou. Much of it was made specifically for foreign trade, and its distribution began before A.D. 883, the date of the abandonment of Samarra (on the Tigris), where typical Yüeh Chou wares, characterized by sand adhering to the foot-ring, have been found. This ware occurs in fair quantity also in the mounds of Fostat (Old Cairo).

The export trade in celadon became brisk in the Sung period (A.D. 960-1279) and reached its peak under the Yüan dynasty (A.D. 1280-1368). Plates of this ware have been found extensively over Asia and East Africa. It occurs, for example, in Persia at Rhages which was destroyed in A.D. 1256. In India, in addition to Arikamedu, it has been picked up at Brāhminābād in Sind and at Kayal on the banks of the Tāmraparṇī in the Tinnevely District.

In the Yüan period (A.D. 1280-1368) the manufacture was extended to Siam, but the products of the Siamese kilns do not appear to have attained the standard or volume of the establishments in China.

The archaeological evidence is supported and supplemented by historical notices. Albirūnī (A.D. 973-1048) refers to the export of these wares to India, Ceylon and Persia.



Salādin of Egypt is said to have made a gift of several examples to Nūr-e-dīn, Sultān of Damascus, A.D. 1171. Marco Polo (A.D. 1288) describes the route of their export from the Chinese port of Ch'u Chou by way of Cochin China and Sumatra to Martaban in Burma,<sup>1</sup> whence it was transhipped to Ceylon and to Coilam or Quilon (Malābār Coast), Gujarāt, Cambay and Mālwa in India, and across the ocean to Zanzibar. The ware was in great demand throughout the ancient orient as much for its supposed medicinal properties as for its aesthetic quality.

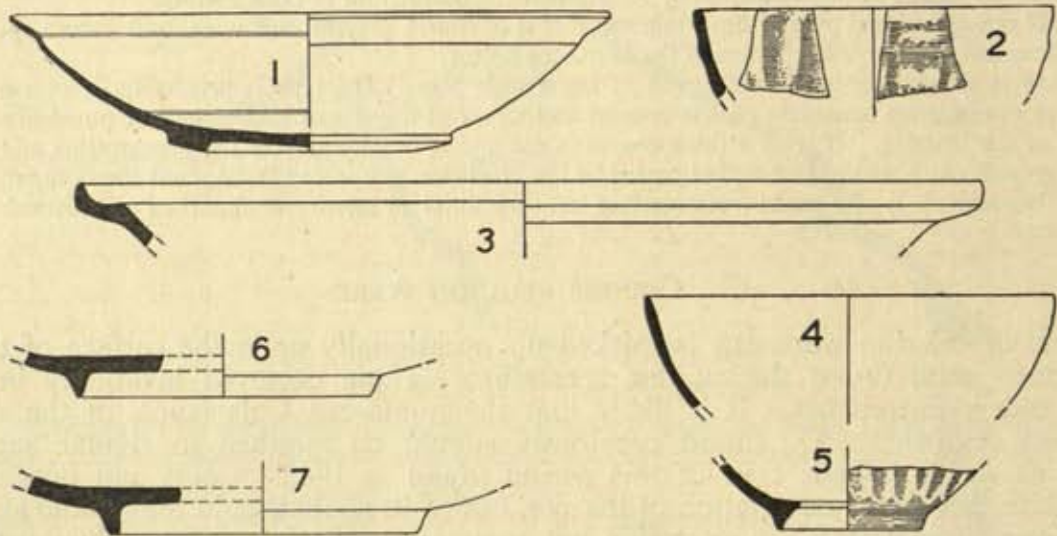


FIG. 39. Chinese celadon ware.  $\frac{1}{2}$

The reference to Coilam or Quilon on the Malābār Coast as a port of call assumes added significance in the light of allusions to this coastal town as a medieval settlement of Chinese merchants.<sup>2</sup> The discovery of celadon at Arikamedu shows that the eastern coast of India not unnaturally had also ports of call for ships engaged in the China trade.

The celadon wares found at Arikamedu have all the characteristics of the Sung and Yüan Lung-Ch'üan wares meant for export trade. As the plain wares are earlier in date than the decorated ones, the Arikamedu specimens (which are invariably plain) may perhaps be ascribed to *circa* tenth-twelfth centuries A.D. An early date is also suggested by the recovery here of a fragment of a typical Yüeh foot-ring with sand adhering to it.

The following examples of this ware from Arikamedu are here illustrated (fig. 39) :—

1. Bowl of thin fabric, from the unstratified French excavations.
2. Rim of a bowl with fluted and ridged body. From a sandy layer immediately underlying a 'spoil-trench' in the Northern Sector (AK VI).
3. Fragment of a dish with hollowed rim for receiving a lid. From an unstratified deposit of the Southern Sector (AK I).
4. Fragment of a plain bowl. From a superficial deposit of the Southern Sector.
5. Base of fluted bowl with foot-ring. From a spoil-trench of the Southern Sector.
- 6-7. Fragments of thick-walled dishes showing foot-ring. From an unstratified deposit of the Southern Sector (AK I).

<sup>1</sup> The transshipment at Martaban was responsible for the popular Persian designation of this ware as *Martabanī*.

<sup>2</sup> See K. P. P. Menon, *History of Kerala*, ed. by T. K. Krishna Menon (Cochin Government Press), I (1924), 270ff.



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## D. ADDENDA TO THE POTTERY

(i) *Comparison of the Arikamedu pottery with North Indian wares*

Although the available evidence for comparison is at present far from extensive, a provisional comparison may be offered between the Arikamedu pottery and that of a few approximately contemporary sites in northern India. The northern sites in question are Taxila (Punjab), Ahichchhatra (U.P.) and Maholi (U.P., near Mathurā).

The comparison reveals very few affinities between the northern and the southern series. The general run of the southern wares is of somewhat coarser fabric than the northern, a difference due in part, perhaps, to the varying qualities of the clay, but emphasized in the South by a generally less sophisticated range in design. Even utilitarian devices such as spouts, handles and pinched lips are very rare at Arikamedu, although fairly abundant in the North.

Two or three types, however, appear to indicate a certain elementary community of tradition between the two regions. The dishes with convex bases and incurved sides, grouped as Type 2 both at Arikamedu and at Ahichchhatra (*Ancient India*, No. 1, p. 45), show a resemblance not merely in form but sometimes also in fabric; and, although the type is not highly specialized, it is possible that the Arikamedu series represents the culmination of a widespread form which, in the North, goes back at least to the fourth century B.C. On the other hand, the very highly polished fabric used for some of the northern dishes and christened Northern Black Polished Ware (ib. p. 55) is not found in the South. The nearest approach to it at Arikamedu is the occasional use of a magnetic lustre (see pp. 51, 94), but this is very rare and constitutes a different technique. Possibly a more significant analogy is presented by the Arikamedu Type 12, which is identical with Ahichchhatra Type 29 (dated A.D. 100-350) and a Kushāna type at Maholi (*Journ. U.P. Hist. Soc.*, XV, 1940, pl. 1); but this type has a wide range in time and space in India and must not be held to imply close cultural or other links. The same reservation applies to Arikamedu Type 12a, which resembles a type found at Taxila (Sirkap) and there datable presumably to the first centuries B.C.-A.D.

(ii) *Chemist's notes*<sup>1</sup>

*Salt-glazing* (see above, pp. 50, 51, 52, 55)

Several specimens of pottery found at Arikamedu in the (earlier) Northern Sector are glazed, showing the characteristic crackled surface or 'crazing' under the microscope. The coating of glaze, however, does not stand out as a distinct layer, and the glazed effect is only superficial. It is therefore highly probable that these specimens were salt-glazed. In the process of firing, when the fuel has almost burnt out in the kiln and the pots are still red-hot, moist salt is thrown into the kiln. Under the intense heat the salt volatilizes and, by reacting chemically on the surface of the pots, produces the glaze.

<sup>1</sup> Supplied by the Chemist of the Archaeological Survey of India.



*Black slip with lustrous finish* (see above, p. 51)

A few potsherds, confined to the pre-Arretine and the lowest Arretine layers of the Northern Sector, show a black slip with a striking metallic lustre. The particles of the black film are magnetic, and chemical analysis shows that the black substance consists largely of magnetic oxide of iron, which is black in colour. There is no doubt that amorphous carbon in the form of soot or smoke also contributes to the black colour. Graphitic carbon is absent. The black substance on the other potsherds sent for comparison from the same site is not magnetic, and thus the difference in lustre and tint must be attributed to the finely divided magnetic oxide of iron. The presence of soot indicates that a smoky fire was used for baking the ware at a moderate temperature. On removing the shiny film a dull black surface is exposed. This black is due to the penetration of fine particles of carbon into the pores of the sherd, and also to the presence of iron in the ferrous condition. It appears that a slip of ferruginous clay was applied to the ware and it was then baked at a moderate temperature in a smoky fire.

*Haematite slip*

A polished bright red slip is occasionally found at Arikamedu in all periods and is identified as haematite. At ordinary temperatures the following oxides of iron are known to have a deep red to light red colour:—

- (1) Anhydrous sesqui oxide of iron, known as haematite. This does not contain any chemically combined water;
- (2) Hydrated oxide of iron, known as limonite;
- (3) Hydrated oxide of iron, known as goethite.

Nos. 2 and 3, natural hydrated ferric oxides, have 9.9 to 13.2% of water of hydration. This chemically combined water is driven off by heating the oxides to dull red heat. Dehydration experiments on goethite at different temperatures show that its complete dehydration and conversion into haematite take place at about 380°C. Furthermore, the finer the grain-size, the faster the dehydration. It is clear, therefore, that whatever be the form of the oxide present in the original slip, baking at 600–700°C. would convert it into anhydrous sesqui oxide of iron or haematite. During the operation of firing, any water present in the oxide of iron will be completely driven off because the temperature of the kiln is likely to be much higher than the dehydration-temperature of the oxide. The presence of goethite or any other hydrated oxide of iron must be ruled out in view of these facts. In order to settle the point, however, surface scrapings of the red slip were heated to dull red heat (700°–800°C.) and loss in weight determined. The loss in weight was inappreciable, whereas if the red material were goethite or limonite, roughly a loss of 10% should have been observed. There is, therefore, no doubt that the red substance present as slip is anhydrous sesqui oxide of iron or haematite.

It is clear from the above that there is no means of finding out whether the original slip was powdered goethite or haematite, for, even if goethite were used in the slip originally, the temperature required for baking and glazing would be sufficiently high for its complete dehydration and conversion into haematite.

*Chinese celadon ware* (above, p. 91)

The composition of the body of the sample submitted is given below:—

SiO <sub>2</sub>	..	..	..	..	73.67%
Al <sub>2</sub> O <sub>3</sub>	..	..	..	..	19.15%
Fe <sub>2</sub> O <sub>3</sub>	..	..	..	..	1.41%
FeO	..	..	..	..	2.43%
CaO	..	..	..	..	3.27%
MgO	..	..	..	..	1.02%
MnO	..	..	..	..	in traces
Alkalies	..	..	..	..	in traces

TOTAL .. 100.95

Copper, lead, cobalt and phosphate are absent. The body is dense and greyish green in colour.

Chemical analysis of the sample shows that the colour of the body is due to iron compounds. A very high temperature must have been used for firing and porcelainizing the clay. Microscopic examination of the body,



however, shows that vitrification is very imperfect and coarse grains of quartz and iron oxide are occasionally observed. Next, the analysis of the body and the glaze was undertaken. This course had to be adopted because very minute quantities were involved and the marked hardness of the sample made it difficult to separate the glaze completely from the body. The results of quantitative analysis are as follows:—

SiO <sub>2</sub>	..	..	..	..	72.32%
Al <sub>2</sub> O <sub>3</sub>	..	..	..	..	19.27%
Fe <sub>2</sub> O <sub>3</sub>	..	..	..	..	1.91%
FeO	..	..	..	..	2.20%
CaO	..	..	..	..	3.99%
MgO	..	..	..	..	0.89%
MnO	..	..	..	..	traces
Alkalies	..	..	..	..	traces
TOTAL ..					100.58

The sample is free from copper, lead, cobalt and phosphate.

The above analysis leads to the conclusion that the greyish green colour of the glaze is due to the presence of ferrous iron. The compound which imparts the characteristic colour to the glaze may be a ferrous silicate or a solid solution of oxide in the complex alumino-silicates present. The results, however, leave no doubt as to the technique of the glazing. When the two analyses are compared, it becomes evident that the compositions of the glaze and the body are quite similar. This accounts for the remarkable freedom of the glaze from 'crazing' or 'crackling'. 'Crazing' is primarily due to difference in the dilatibility of the body and the glaze when exposed to changes in temperature. When the body and the glaze are similar in chemical composition, there is little difference in the rate of expansion and the glaze may not show any 'crazing'. When, however, there is a wide divergence in the rate of expansion owing to difference in chemical composition, the glaze is often crackled or crazed. The body and the glaze seem to have been fired in one operation.

The presence of a large number of bubbles or spherulites in the glazed surface, as shown by the microscope, suggests that the glazing was imperfect owing to incomplete vitrification of the constituents of the glaze. Its freedom from alkalies and lead would require a very high temperature of firing for complete vitrification, when the easily fusible ferrous silicates and complex iron-alumino-silicates would combine with the more refractory clay and produce the glaze. An application of extremely finely levigated ferruginous clay to the dried ware of the same type of clay, followed by drying and polishing to level the coating, and subsequent firing at a very high temperature in a reducing atmosphere, would be the necessary condition for the formation of the glazed ware under investigation.

## 5. OTHER SMALL FINDS

The chronological scheme into which the other small finds (equally with the pottery) are fitted has been detailed above, p. 50. Finds from strata, mostly late, which could not be equated with any building-period or significant sequence, together with those from AK I, a much disturbed site in the Southern Sector, are grouped as 'unstratified'.

### E. BEADS

More than two hundred beads of various materials were found in the excavations, besides a number of unfinished ones and fragments of semi-precious stones doubtless intended for the industry. It is evident that beads were manufactured on a large scale at Arikamedu.<sup>1</sup>

<sup>1</sup> Besides the semi-precious stones mentioned below, several pieces of obsidian and green jasper have also been found, together with much glass-slag.



The materials used for the manufacture of beads fall under the following heads:—

*Semi-precious stones:* (a) Chalcedonic quartz, including agate and carnelian.

(b) Crystalline quartz, including crystal and amethyst.

*Shell.*

*Bone.*

*Gold.*

*Terracotta.*

*Faïence.*

*Glass.*

Of the semi-precious stones, amethyst and carnelian account for ten beads each, crystalline quartz eight, and agate, banded or plain, four. Though amethyst occurs even in the post-Arretine deposits in the Northern Sector there is only one specimen of it in the Southern Sector, found in mixed soil a few inches below the surface. It is therefore possible that the stone fell into disuse as a bead-making material in the latter part of the life of the town.

Carnelian is distributed in all the periods with a fair uniformity. Agate and quartz-crystal are absent in the pre-Arretine and Arretine strata of the Northern Sector. Whether this phenomenon is due to their late appearance as a bead-making material in this part of the country or to the limited area in which the pre-Arretine and Arretine strata were touched cannot be said.

Shell, on the other hand, is not represented in the collection from the Southern Sector, though thirteen shell beads were found distributed at all levels in the Northern. This again may be an accidental feature, as the fishing of shell is a long-established industry on the southern coast of India. Bone beads are rare, there being only two specimens, one each from the Arretine and the post-Arretine levels in the Northern Sector.

Three gold beads have been found at Arikamedu:—

1. From an Arretine-producing layer (AK II, 8A) of the Northern Sector: barrel-shaped in elevation and scalloped or fluted in cross-section. Comparable with fluted gold beads from Taxila (Bhir Mound), dated to the end of the fourth century B.C.,<sup>1</sup> but the type is of much earlier origin, occurring, for example, in the temple of E-anna at Uruk at the end of the third millennium B.C. (Iraq Museum, Baghdad). Fig. 41, 40; pl. XXXIVA, 1.
2. From a post-Arretine deposit of the same Sector (AK II, 4): short-barrel circular. Fig. 41, 41; pl. XXXIVA, 2.
3. From the previous excavations, and now in the Pondicherry Bibliothèque: long-barrel circular. Pl. XXXIVA, 3.

Faïence is rare, being represented by one bead from a post-Arretine layer in the Northern Sector, and another from near the surface in the Southern.

There are sixteen terracotta beads from all levels of both the Sectors. They show little variation of shape, being always either pear-shaped or spherical: the latter are found only in the Southern Sector, along with the pear-shaped ones. These objects are very common on all ancient sites and have often been described as spindle-whorls, which indeed some of the larger specimens may have been.

A majority of the beads is made of glass. The range of colour is limited: shades of blue and green are the most popular colours throughout, followed by copper-red; less common colours being white and black, whilst yellow, violet, brown and grey are rarely represented. The material is generally opaque but sometimes translucent; transparent glass

<sup>1</sup> *Ancient India*, No. 1 (1946), p. 32.



is absent. A few very tiny glass beads, spherical or spheroid in shape, have been found in all periods of the site.<sup>1</sup> Some glass beads from the later strata in the Southern Sector are misshaped in manufacture. (Cf. fig. 40, 33 and 34.)

The range of bead-shapes is not very large, nor can it be affirmed that any particular shape, unless possibly the lug-collared type (see below), was restricted to any period or material. The main shapes represented are: spherical, spheroid, pear-shaped, cylindrical, barrel, truncated bicone, oblate and collared. Some of them may be divided into sub-types, such as circular, square, hexagonal, etc., according to their cross-sections.<sup>2</sup>

The spherical and spheroid shapes continued to be the most common throughout the occupation of the town. The more specialized shapes may also be said to have continued generally throughout. It is true that the shapes represented in the pre-Arretine and Arretine periods are much more limited in number than in the later periods, but this is probably due to the relatively small area in which these levels were excavated. On the whole, it may be held that there is no marked disappearance of old shapes or sudden emergence of new ones in the later periods.

The only possible exception to these generalizations is presented by a class of beads known as 'collared' beads, which are generally barrel-shaped in elevation with an attachment at either end. These attachments may be inconspicuous, being merely formed by shallow incisions near the ends which hardly disturb the profile of the bead, or may be in the form of prominent lugs. The class may thus be divided into 'groove-collared' and 'lug-collared'. Of the five groove-collared beads in the present collection, one each comes from the pre-Arretine, Arretine and post-Arretine deposits of the Northern Sector; the fourth and fifth ones are from the Southern Sector, found very near the surface, and are of no stratigraphic consequence. The lug-collared beads first make their appearance in the 'Arretine' period (first half of first century A.D.), and continue throughout the post-Arretine layers of the Northern Sector to the latest period of the Southern (second century A.D.). A conclusion may be hazarded that on this site the groove-collared beads antedate the lug-collared ones, but the inference must be checked by a study of this class of beads from other stratified sites. The Pondicherry Bibliothèque contains three new types of collared beads found previously at Arikamedu, besides those found in the present excavations: (1) a barrel roughly elliptical groove-collared bead of amethyst (fig. 41, 50); (2) a barrel plano-convex lug-collared bead of glass (fig. 41, 57); and (3) a cornerless cube lug-collared bead of amethyst (fig. 41, 58).

Collared beads have a very wide distribution in India and outside. In India, apart from a sort of prototype at Mohenjodaro (third millennium B.C.),<sup>3</sup> they are known to occur at Chandravalli (Mysore State) in a stratum which produced two denarii of Tiberius (died A.D. 37), Konḍāpur and Māski (Hyderabad State) in strata said to be of the Āndhra period, Śiśupāl near Bhubaneswar (Orissa), Kauśāmbī (United Provinces), Pāṭaliputra (Bihar), Durgāpur (Bengal), and in both the two city-sites, Bhīr Mound and Sirkap, at Taxila (Punjab).<sup>4</sup> As the chronology of Taxila has been fixed with fair accuracy, it may be helpful to analyze the

<sup>1</sup> The three smallest ones measure .05, .06 and .08 inch respectively.

<sup>2</sup> The method of classification adopted here is that of H. Beck, 'Classification and Nomenclature of Beads and Pendants', *Archaeologia*, LXXVII (1928), 1ff., and is as follows: Hold a bead with its hole in the horizontal position and parallel to the eye. The elevation thus obtained is its primary shape. The cross-section through its centre, cutting the hole at right angles, gives its secondary shape.

<sup>3</sup> J. Marshall, *Mohenjodaro and the Indus Civilization* (1931), III, pl. CXLIX, fig. 5.

<sup>4</sup> In the Durgāpur collection of Mr. Ajit Kumar Mukerji, there are two collared beads, one of each variety. In all other cases the lug-collared type is predominant, though the other type is not unknown. These details are derived from the drawings of Chandravalli beads kindly supplied by the Director of Archaeology, Mysore; photographs of Konḍāpur and Māski beads by the Superintendent of Archaeology, Hyderabad; and drawings



occurrence of these beads there. The Bhir Mound, believed to have been deserted in the second century B.C. after an existence of about three hundred years, yielded five groove-collared and three lug-collared beads; while Sirkap, which had been founded at the time of the desertion of the Bhir Mound and continued in occupation until the end of the first or beginning of the second century A.D., yielded only one groove-collared and seven lug-collared beads. One more lug-collared bead comes from Jauliān, a late monastic settlement. The priority of the groove-collared beads over the lug-collared ones is therefore fairly established at Taxila; but the occurrence of the latter in the Bhir Mound suggests that it was a known type by the second century B.C.

Outside India, collared beads at Gezer in Palestine have been dated B.C. 1000-500.<sup>1</sup> Ribbed gold beads with a collar at each end have been found in late Mycenaean tombs at Enkomi and Curium in Cyprus.<sup>2</sup> Collared beads have also been produced from other graves in Cyprus dated to the first half of the sixth century B.C.<sup>3</sup> Beck illustrates one groove-collared bead from Ur (before B.C. 600) and three lug-collared ones from Egypt (XIIth Dynasty), Praeneste (B.C. 800) and Cumae (B.C. 500) respectively.<sup>4</sup>

In the Pondicherry Bibliothèque are the following shapes, derived from the previous explorations but not represented in those of 1945:—

(1) A short-barrel gadrooned bead of carnelian comparable with the gold bead, fig. 41, 41, and pl. XXXIVA, 1, and doubtless derived from a metal prototype (fig. 41, 61); (2) a barrel (almost plano-convex) tabular bead of banded agate (fig. 41, 59); (3) an eye-bead of banded agate (fig. 41, 63); (4) a double-eye bead of the same material (fig. 41, 62); and (5) a frog-bead of light green glass<sup>5</sup> (fig. 41, 60).

*List of selected beads (figs. 40-41)*

1. Carnelian: spherical. Unstratified. (AK IV-206.)
2. Glass: spheroid. Unstratified. (AK IV-99.)
3. Glass: spheroid. Unstratified. (AK I-188.)
4. Glass: spheroid. Arretine. (AK II-244.)
5. Glass: spheroid. Arretine. (AK II-275.)
6. Glass: spheroid. Arretine. (AK II-459.)
7. Glass: spheroid. Post-Arretine. (AK VI-13.)
8. Glass: spheroid. Unstratified. (AK I-97.)
9. Glass: spheroid. Post-Arretine. (AK II-10.)
10. Shell: spheroid. Post-Arretine. (AK II-389.)
11. Glass: truncated bicone circular. Post-Arretine. (AK II-501.)
12. Glass: truncated bicone circular. Post-Arretine. (AK II-406.)
- 12A. Glass: truncated bicone circular. Unstratified. (AK IV-294.)
13. Glass: short-oblate circular. Post-Arretine. (AK II-463.)
14. Glass: short-oblate circular. Post-Arretine. (AK V-106.)
15. Glass: short-oblate circular. Arretine. (AK II-407.)
16. Glass: barrel circular. Arretine. (AK II-407A.)
17. Glass: barrel circular. Arretine. (AK II-401.)
18. Glass: barrel elliptical. Post-Arretine. (AK VII-17.)
19. Faience: long-barrel circular. Post-Arretine. (AK III-37.)

of Kauśāmbī and Pāṭaliputra beads in the Patna Museum and photographs of Durgāpur beads by the Superintendents, Archaeological Survey of India, Central and Eastern Circles respectively.

<sup>1</sup> R. A. S. Macalister, *The Excavation of Gezer* (1912), II, p. 112, and III, pl. CXXXVII, 60.

<sup>2</sup> Murray Smith and Walters, *Excavations in Cyprus* (Brit. Mus., 1900), pp. 65, 81 and pls. VIII and XIII.

<sup>3</sup> Ohnefalsch-Richter, *Kypros, the Bible and Homer* (1893), pls. LXVII, 7; CXLIV, 2 and 5; and possibly pl. XXV, 7, and p. 208, fig. 170.

<sup>4</sup> H. Beck, *op. cit.*, p. 15, fig. 16; p. 4, fig. 8; p. 15, fig. 16; and p. 67, fig. 74.

<sup>5</sup> Frog-beads have been found also at Taxila. H. Beck, 'The Beads from Taxila', *Memoir of the Archaeological Survey of India*, No. 65 (1941), pl. VII. They also occur at Kauśāmbī (U.P.); specimens in the Allahabad Museum. For eye-beads, see Beck, *op. cit.*, pl. I.



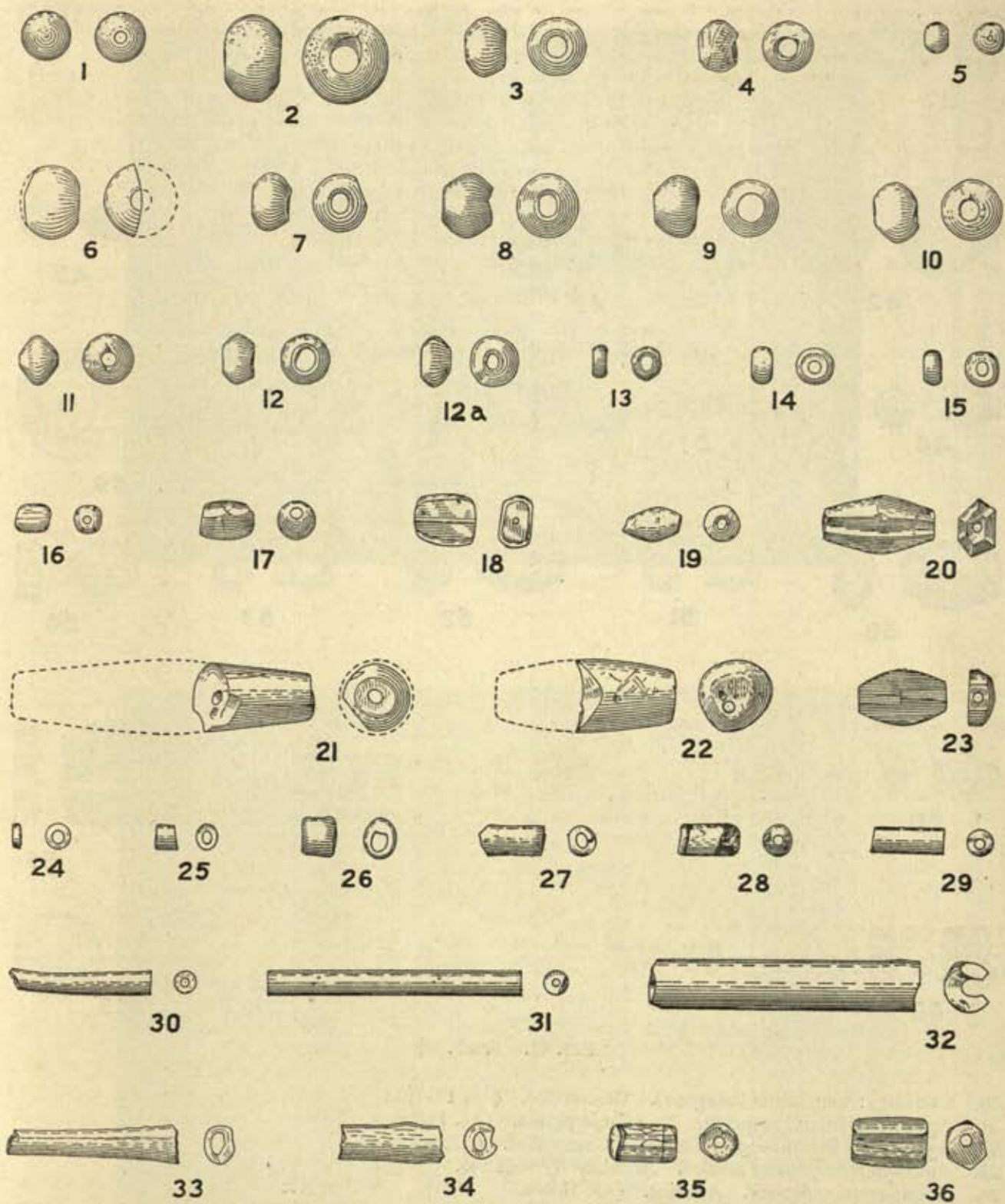


FIG. 40. Beads. †



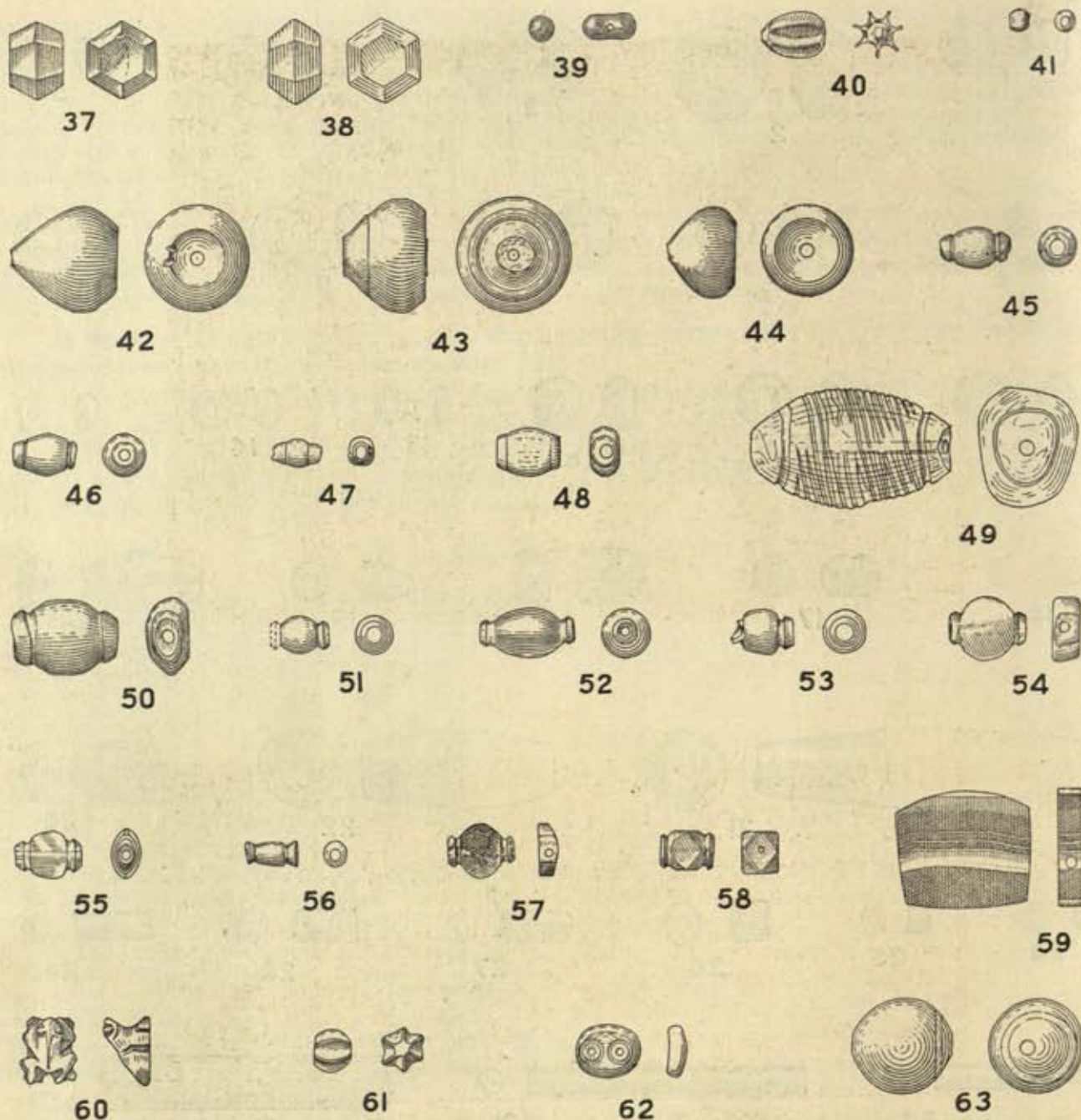


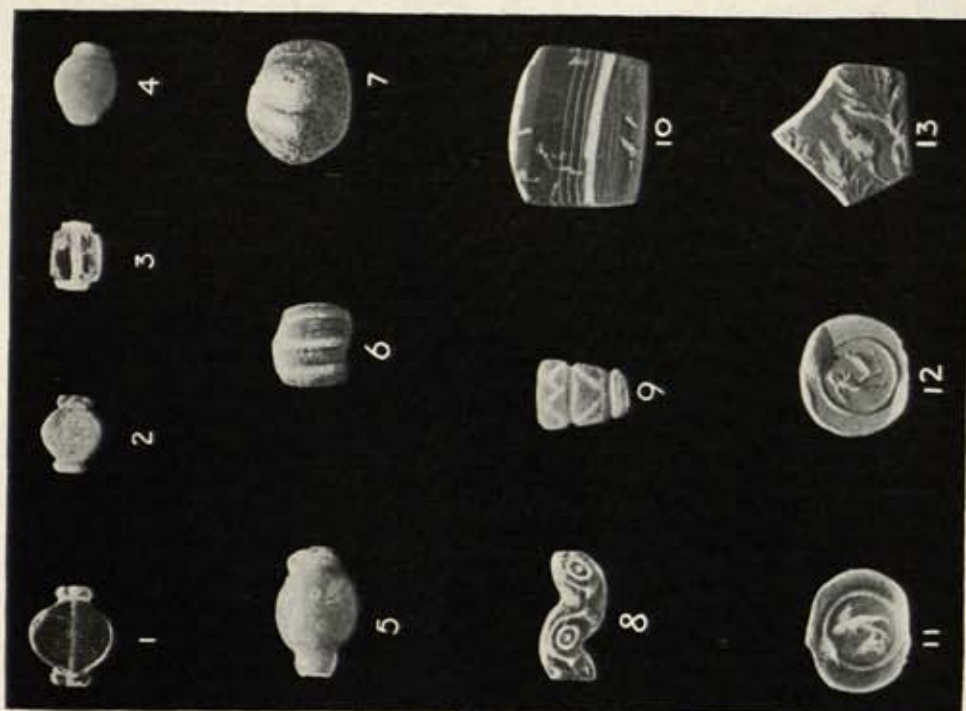
FIG. 41. Beads. †

20. Carnelian: long-barrel hexagonal. Unstratified. (AK IV-113.)  
 21. Agate: long-barrel elliptical. Late Drain period. (AK IV-266.)  
 22. Agate: long-barrel roughly circular. Unstratified. (AK I-161.)  
 23. Amethyst: long-barrel tabular. Arretine. (AK II-545.)  
 24. Glass: tabular circular. Arretine. (AK II-490.)  
 25. Glass: cylindrical circular. Arretine. (AK VI-10.)  
 26. Glass: cylindrical circular. Unstratified. (AK IV-125.)



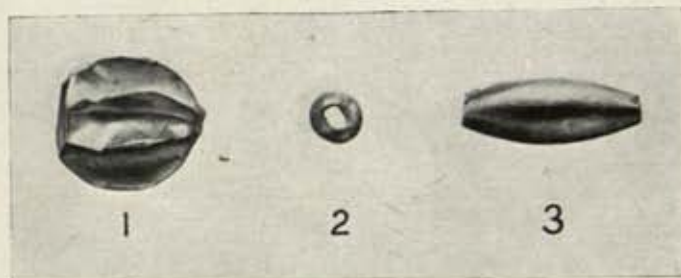


A. Type 75, pointed bases in situ, site AK I  
(Scale of feet and inches)

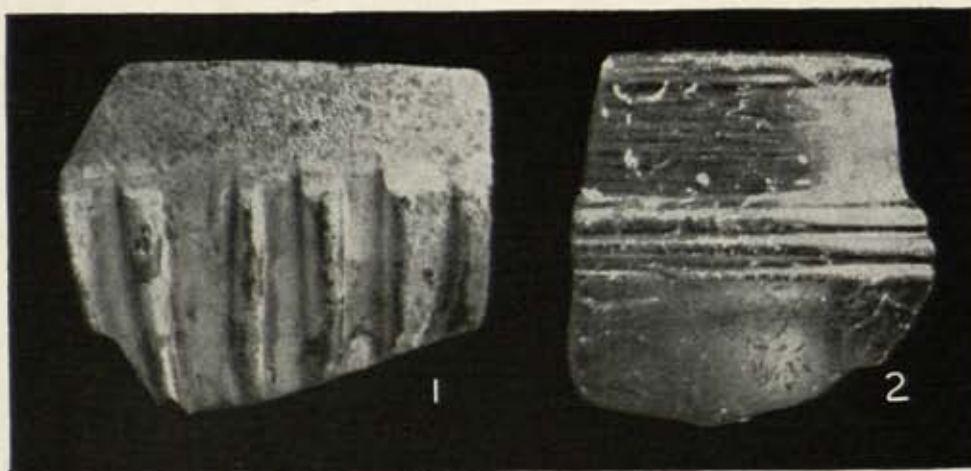


B. Objects found previously at Arikamedu :  
1-2, 4-7, glass beads ; 3, amethyst bead ; 10, bead of  
banded agate ; 8-9, glass bracelets ; 11-12, Graeco-Roman  
crystal gem, with impression ; 13, sherd of decorated  
Arretine ware.  $\frac{1}{1}$





A. *Gold beads.* Scale 2 : 1



B. *Roman glass.*  $\frac{1}{1}$



27. Glass: long-cylindrical circular. Unstratified. (AK I-93.)
28. Agate: long-cylindrical circular. Post-Arretine. (AK II-487.)
29. Glass: long-cylindrical circular. Post-Arretine. (AK V-39.)
30. Glass: long-cylindrical circular. Unstratified. (AK I-108.)
31. Glass: long-cylindrical circular. Arretine. (AK II-315.)
32. Glass: long-cylindrical circular. Post-Arretine. (AK III-65.)
33. Glass: long-cylindrical circular (misshaped). Unstratified. (AK IV-25.)
34. Glass: long-cylindrical circular (misshaped). Unstratified. (AK IV-146.)
35. Agate: cylindrical circular. Post-Arretine. (AK II-221.)
36. Amethyst: cylindrical hexagonal. Arretine. (AK II-238.)
37. Amethyst: truncated bicone hexagonal. Post-Arretine. (AK II-453.)
38. Crystalline quartz: truncated bicone hexagonal. Unstratified. (AK I-27.)
39. Glass: toggle. Post-Arretine. (AK VII-20.)
40. Gold: long-barrel fluted. Arretine. (AK II-359.) (See also pl. XXXIVA, 1.)
41. Gold: circular. Post-Arretine. (AK II-596.) (See also pl. XXXIVA, 2.)
42. Terracotta: pear-shaped. Pre-Arretine. (AK V-90.)
43. Terracotta: pear-shaped. Pre-structural. (AK IV-300.)
44. Terracotta: pear-shaped. Early Phase. (AK IV-232.)
45. Glass: barrel circular groove-collared. Pre-Arretine. (AK II-558.)
46. Glass: barrel circular groove-collared. Arretine. (AK II-548.)
47. Glass: barrel circular groove-collared. Post-Arretine. (AK II-483.)
48. Glass: barrel elliptical groove-collared. Unstratified. (AK I-29.)
49. Quartz-crystal: unfinished barrel groove-collared. Unstratified. (AK IV-48.)
50. Amethyst: barrel roughly elliptical groove-collared. Pondicherry Bibliothèque.
51. Shell: barrel circular lug-collared. Arretine. (AK II-390.)
52. Amethyst: barrel circular lug-collared. Post-Arretine. (AK II-544.)
53. Glass: barrel circular lug-collared. Post-Arretine. (AK II-125.)
54. Amethyst: barrel tabular lug-collared. Post-Arretine. (AK VII-38.)
55. Crystalline quartz: barrel elliptical lug-collared. Unstratified. (AK I-5.)
56. Glass: barrel circular lug-collared. Unstratified. (AK IV-108.)
57. Glass: barrel plano-convex lug-collared. Pondicherry Bibliothèque.
58. Amethyst: cornerless cube lug-collared. Pondicherry Bibliothèque.
59. Agate: barrel (almost plano-convex) tabular. Pondicherry Bibliothèque. (See also pl. XXXIII, 10.)
60. Glass: frog-bead. Pondicherry Bibliothèque.
61. Carnelian: barrel gadrooned. Pondicherry Bibliothèque.
62. Agate: elliptical plano-convex double-eye. Pondicherry Bibliothèque.
63. Agate: spherical single eye. Pondicherry Bibliothèque.

#### F. GRAECO-ROMAN GEM (PL. XXXIIIB, 12)

Reference has been made to the casual discovery of a gem said to bear the head of Augustus in intaglio (above, p. 21). The Bibliothèque at Pondicherry also contains a quartz intaglio of Graeco-Roman workmanship representing Cupid and a bird, apparently an eagle. The gem is untrimmed and may therefore have been made locally by a Mediterranean craftsman. It was found on the site but there is no record of the circumstances.

#### G. ROMAN LAMP (FIG. 42, 1)

Fragment of the disc and side-volute of a Roman lamp, here restored in accordance with the normal form of the Augustan period (early first century A.D.). Of fine red ware. Found in the spoil-trench over the principal wall of AK II; not stratified. Another fragment of a Roman lamp was found in the previous excavations.



# H. ROMAN GLASS BOWLS

(1) Fragment of pillar-moulded bowl of whitish iridescent glass. Northern Sector, post-Arretine. Bowls of this type originated apparently in Italy, and spread throughout the Roman world from the end of the first century B.C. to the end of the first century A.D. In Germany, they occur at Haltern (11 B.C.–A.D. 16) and are very common at Hofheim (A.D. 40–51), but are almost completely absent from the forts of the German Limes, dating from the end of the first century A.D. onwards.<sup>1</sup> Fig. 42, 2; also pl. XXXIVB, 1. Fragments of four or five similar bowls were found at Arikamedu by the French excavators.

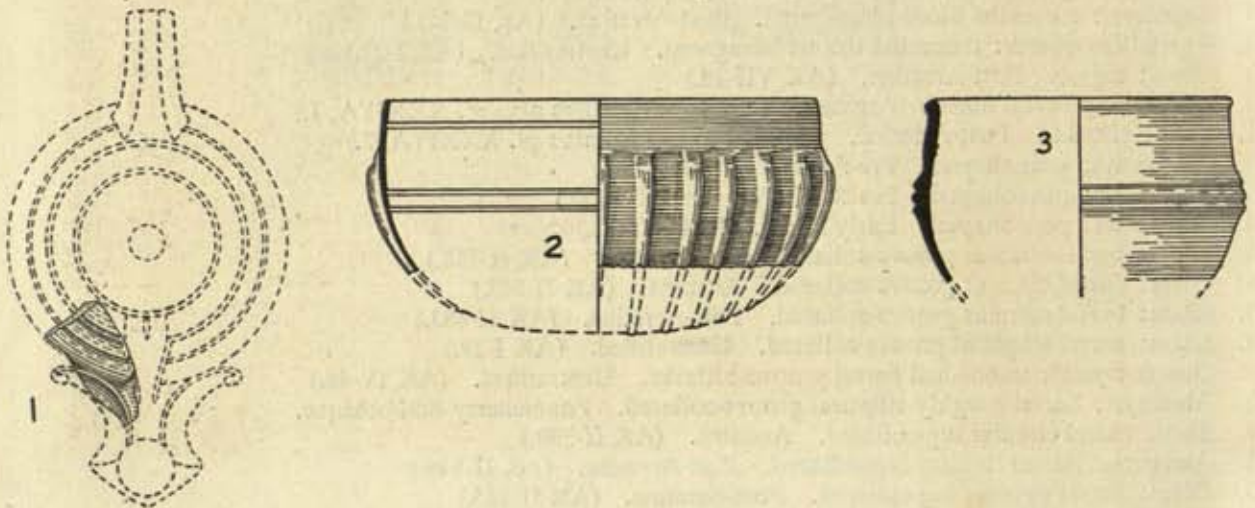


FIG. 42. 1, Roman pottery lamp; 2-3, Roman glass bowls.  $\frac{1}{2}$

(2) Fragment of bowl of blue glass with horizontally ribbed side. Northern Sector, pre-Arretine. Doubtless also of Mediterranean origin. Fig. 42, 3; also pl. XXXIVB, 2.

# I. TERRACOTTA OBJECTS

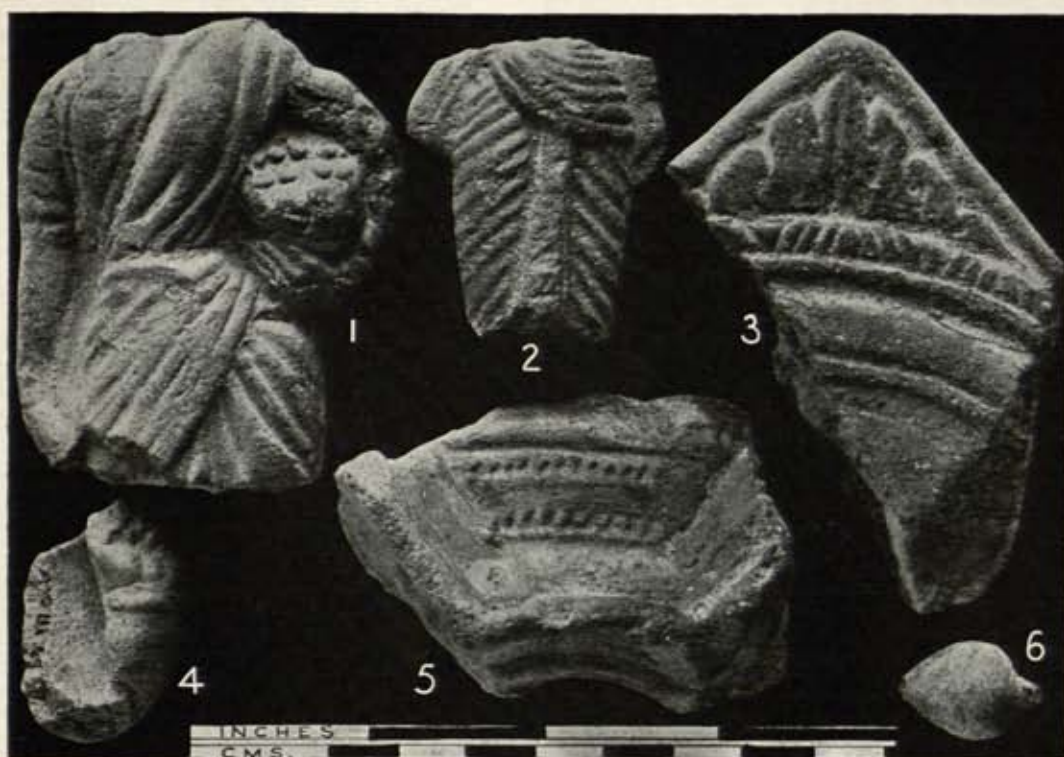
Compared with the prolific sites of northern India, the terracotta objects found at Arikamedu are surprisingly few in number. Nor can these few be put in their proper places among analogous finds from South Indian sites, as very little terracotta material from South India is at present available for study. The following objects, together with the beads mentioned above (p. 96), comprise the whole of the terracotta from the present excavation:—

(1) Torso of a female figure in the round. The right arm hangs down and touches the hip, while the left is placed akimbo, holding a basket of seeds or fruits. The figure is heavily draped, the right end of the *sārī* being tucked up and wound round the waist (pl. XXXVA, 1). Northern Sector, pre-Arretine (end of first century B.C. or beginning of first century A.D.).

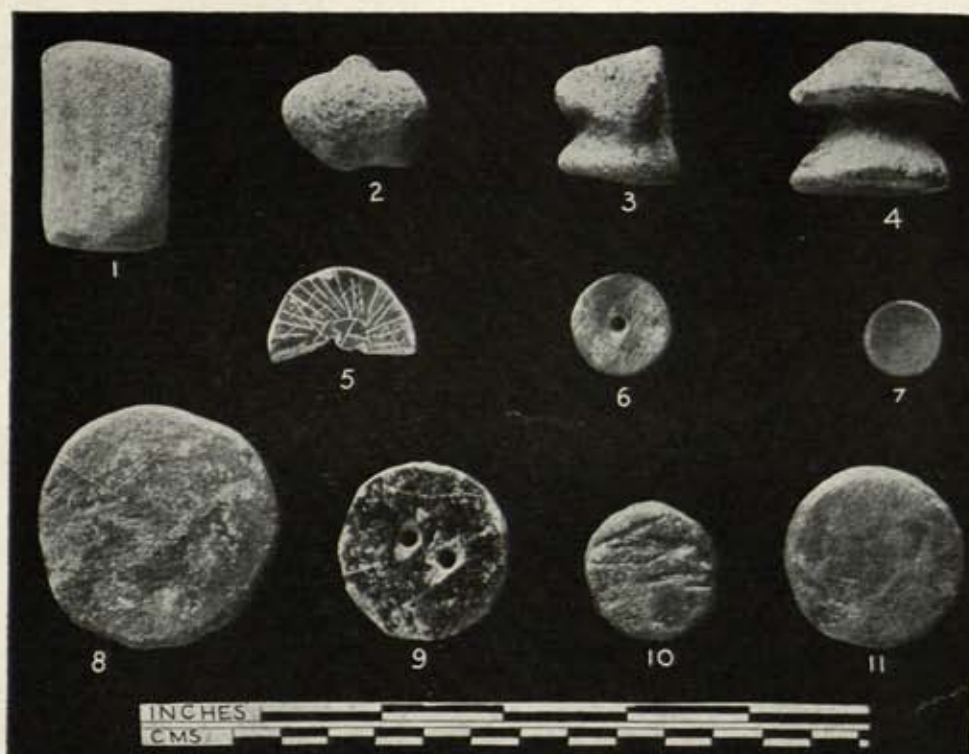
(2) Torso of a female figure in the round. The left hand hangs down and touches the hip, while the right is probably held akimbo. The figure is also heavily, but somewhat differently, draped. The upper garment, starting obviously from the right shoulder, passes below the left arm; the folds of the lower one are depicted by oblique parallel lines. A long raised tassel hangs throughout the centre of the lower portion of the body (pl. XXXVA, 2). Northern Sector, Arretine period (first half of first century A.D.).

<sup>1</sup> See E. Ritterling, *Das Frühromische Lager bei Hofheim*, pp. 371-2.



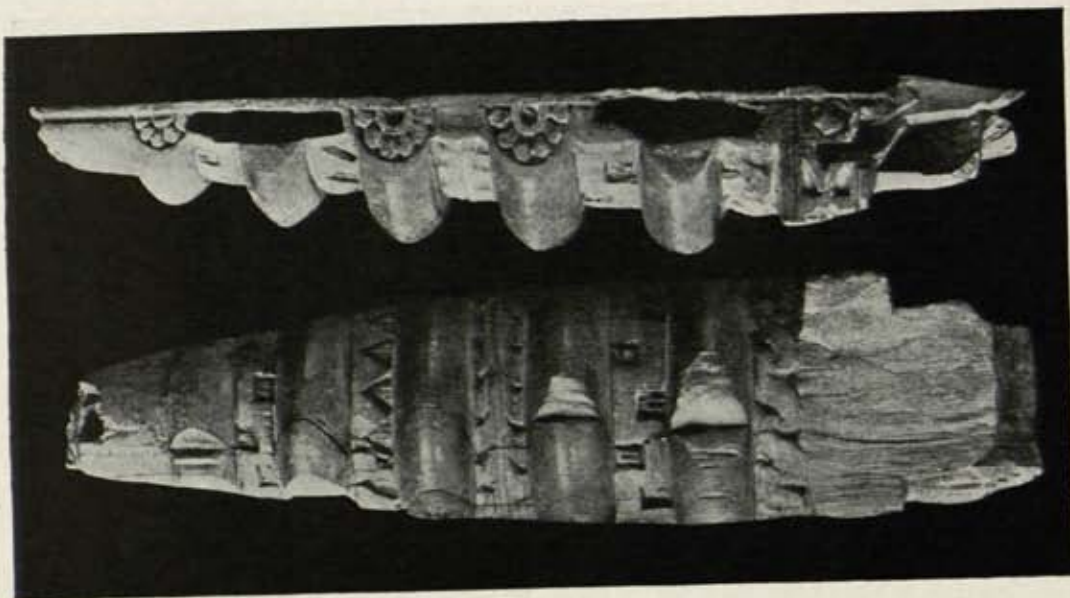


A. *Terracottas found in 1945*

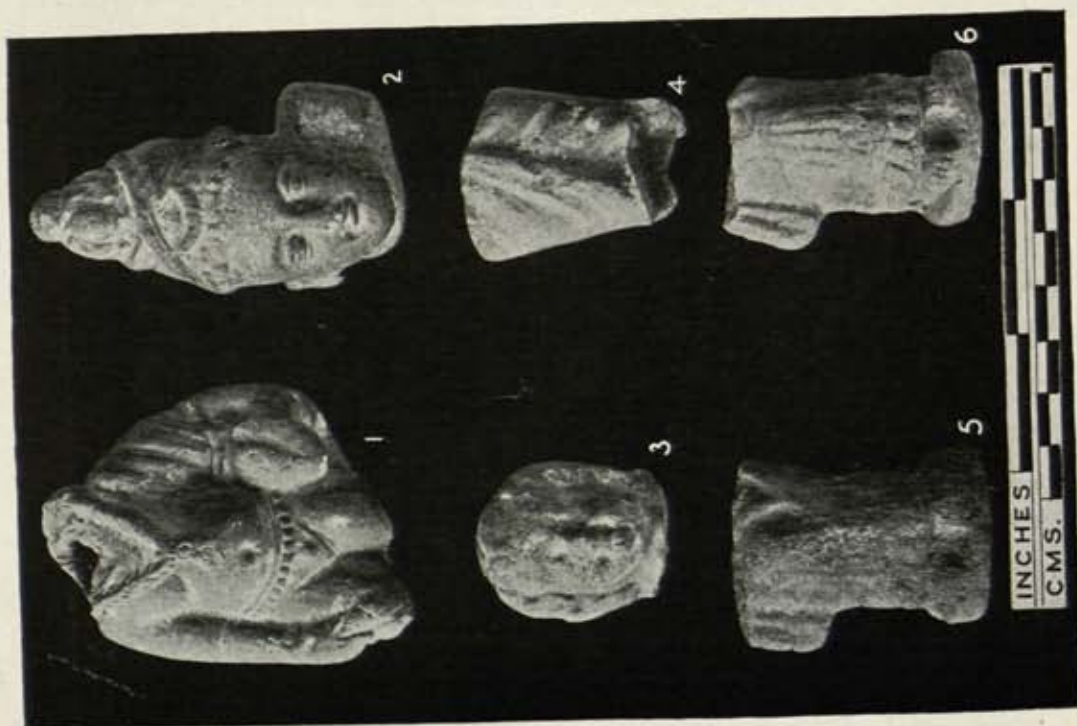


B. *Gaming pieces, etc.*



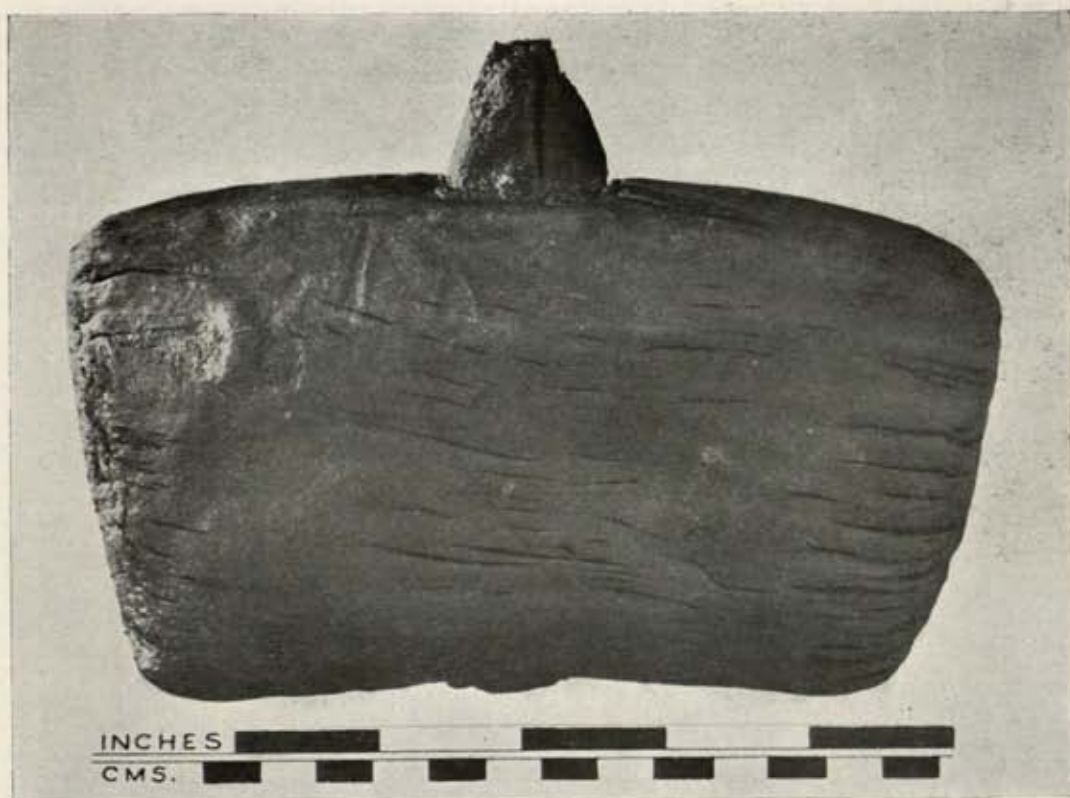


B. Carved ivory found before 1945.  $\frac{1}{1}$



A. Terracottas found at Arikamedu before 1945





A. *Wooden mallet, pre-Arretine*

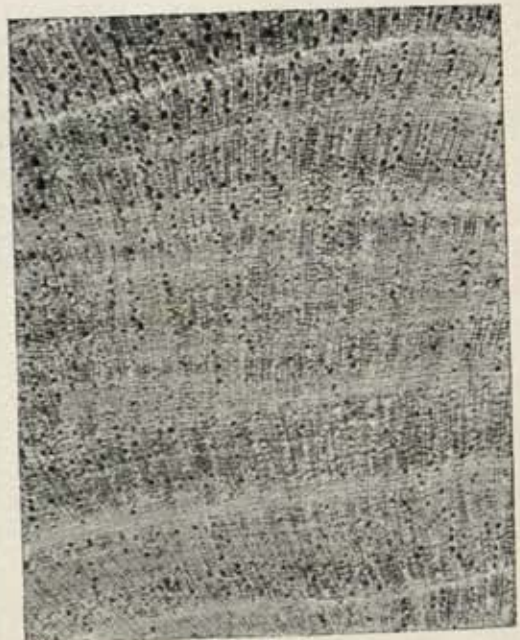


B. *Rope, pre-Arretine*





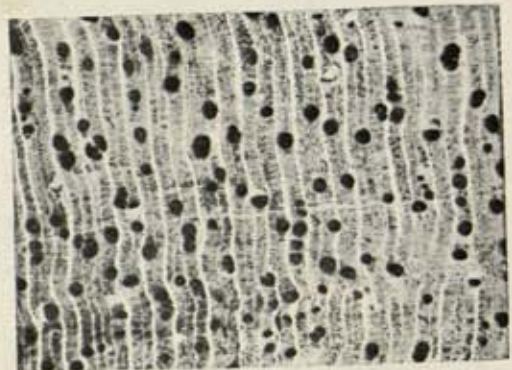
1



2



3



4



5

Sections of wood from pre-Arretine layers. 1-2, cross-sections of AK II, 552; 3, tangential section of AK II, 552; 4, cross-section of AK II, 554, well-preserved portion; 5, cross-section of AK II, 554, badly twisted portion. All magnified 10 times, except No. 3 which is magnified 50 times.



(3) Left upraised hand of a human figure with a bangle, the fingers clutching what seems to be the stalk of a flower (pl. XXXVA, 4). Northern Sector, post-Arretine (second half of first century A.D.).

(4) Fragment of a square or rectangular slab of the *āyāgapāṭa* type. The portion round the centre seems to have been undecorated. Beyond are concentric circles, followed in the extant corner by a conventional honeysuckle design. The edges are decorated by oblique hatching (pl. XXXVA, 3). Southern Sector, Late Phase.

(5) Irregularly shaped fragmentary object, possibly of the 'votive tank' type. The field is decorated with short notches (pl. XXXVA, 5). Southern Sector, unstratified.

(6) Object similar to the above, but more fragmentary. Southern Sector, unstratified.

(7) Crude shapeless model of an animal; a lump on the back may indicate that it was intended to represent a humped bull (pl. XXXVB, 2). Southern Sector, unstratified.

(8) and (9) Two gaming pieces, one depicting a human head with a projecting snout (pl. XXXVB, 3 and 4). Southern Sector, unstratified.

(10) Cylinder, probably also a gaming piece (pl. XXXVB, 1). Southern Sector, unstratified.

(11) Pear-shaped object with projecting knob or foot, probably a top (pl. XXXVA, 6). Southern Sector, unstratified.

A large number of terracotta discs were found from all deposits in both the Sectors except the pre-Arretine (an exception which may be accidental). Some of these pieces are only potsherds made into a roughly circular shape by rubbing, but there are a few which are deliberately moulded to shape. Some of the former class have one or two perforations at the centre, and one is decorated with rough scratches. All these may be regarded as gaming pieces. Pl. XXXVB, 5-11.

The following terracottas found during previous excavations and now in the Bibliothèque at Pondicherry may be added. They are not independently dated.

(1) Torso of a male figure, nude or more probably with diaphanous drapery. The pendant right hand holds a hook-like object, and the left a large indistinct object against the hip. The figure wears a thick necklace of cabled design, ending in two large rosette-shaped pendants and a girdle of pellets (pl. XXXVIA, 1).

(2) Head of a male figure, evidently Śiva. The high conical mass of matted hair is entwined by a serpent, and its forepart bears a crescent. The eyes are half-closed (pl. XXXVIA, 2).

(3) Head of a male figure, much defaced. The hair is curled and hangs below the ears (pl. XXXVIA, 3).

(4) Fragment of a female figure. The drapery is somewhat similar to that of No. 1 of the 1945 series (pl. XXXVIA, 4).

(5) and (6) Lower portion of two female figures standing on round pedestals. They are clad in loose skirts, which cover part of the feet, only the toes being visible (pl. XXXVIA, 5 and 6).

#### J. METAL OBJECTS

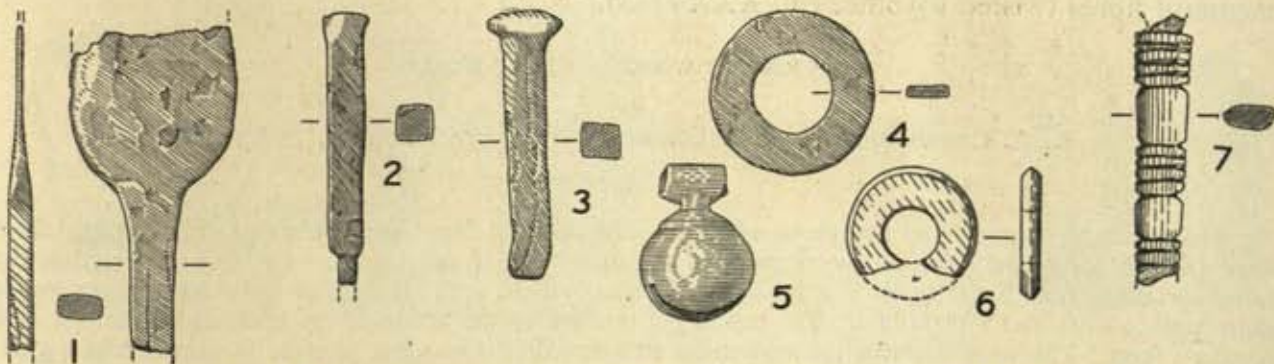


FIG. 43. 1-4, iron objects; 5, copper rattle; 6, quartz ring; 7, ivory handle. 1/2



Besides a number of shapeless lumps of iron found almost everywhere, the following objects may be recorded:—

- (1) Iron ring (fig. 43, 4). Northern Sector, post-Arretine.
- (2) Fragmentary iron blade, tanged (fig. 43, 1). Southern Sector, unstratified.
- (3) and (4) Two iron nails, one of them with a round head (fig. 43, 2-3). Southern Sector, Early Phase, and unstratified respectively.
- (5) Copper rattle with a slit and a loop for suspension (fig. 43, 5). Southern Sector, Late Drain Period (second century A.D.).

#### K. STONE OBJECTS

The following stone objects deserve mention:—

- (1) Short cylindrical object of sandstone, possibly a weight. Northern Sector, pre-Arretine.
- (2) Fragmentary grinding-stone of sandstone. Northern Sector, post-Arretine.
- (3)–(6) Four fragmentary cylindrical pestles, two of granite and two of sandstone. Southern Sector, unstratified.
- (7) Complete celt of trap (fig. 44, 4). Southern Sector, pre-structural.
- (8) Fragmentary celt of sandstone. Southern Sector, near the surface.
- (9) Knob of the steatite lid of a casket. Southern Sector, unstratified.

#### L. WOODEN OBJECTS AND ROPES

The water-logged sand and slime below sea-level in the Northern Sector preserved a number of pieces of wood, mostly unfashioned but in some cases shaped, together with a cocoanut shell and a few pieces of palm shell and rope, all in the pre-Arretine layers (late first century B.C. or early first century A.D.).

Of the wooden objects the following deserve mention:—

- (1) Roughly fashioned block of wood, with its central portion scooped out, resembling a cumbrous shuttle, possibly a toy-boat (fig. 44, 1).
- (2) Leg of a cot or stool, roughly carved, with two rectangular mortices cut into its upper portion to receive the wooden bars forming the frame (fig. 44, 3).
- (3) Cylindrical piece of wood, carved into zones with shallow incised lines, possibly a toggle.
- (4) Mallet, handle broken (fig. 44, 2; also pl. XXXVIIA).

Of the numerous pieces of rope the longest had a length of about nine inches and a diameter of about one inch. Like all the other pieces it was made of three strands of cocoanut fibres twisted together (pl. XXXVIIB).

#### REPORT ON WOOD AND FRUIT SHELLS

By

K. A. CHOWDHURY and S. S. GHOSH, *Forest Research Institute, Dehra Dun*

##### 1. Material

Six specimens of wood and two pieces of fruit shells, collected from Arikamedu (near Pondicherry) from about 4 feet below the sea-level, were received for identification and report. On first examination the wood specimens were found to be in a late stage of deterioration. All attempts to cut clean surfaces with a sharp pocket-knife met with failure. The tissues got crushed by the action of the knife and came out in a powdery form. This so obliterated the anatomical structure that it was not possible to hazard even a guess as to the identity of these specimens.



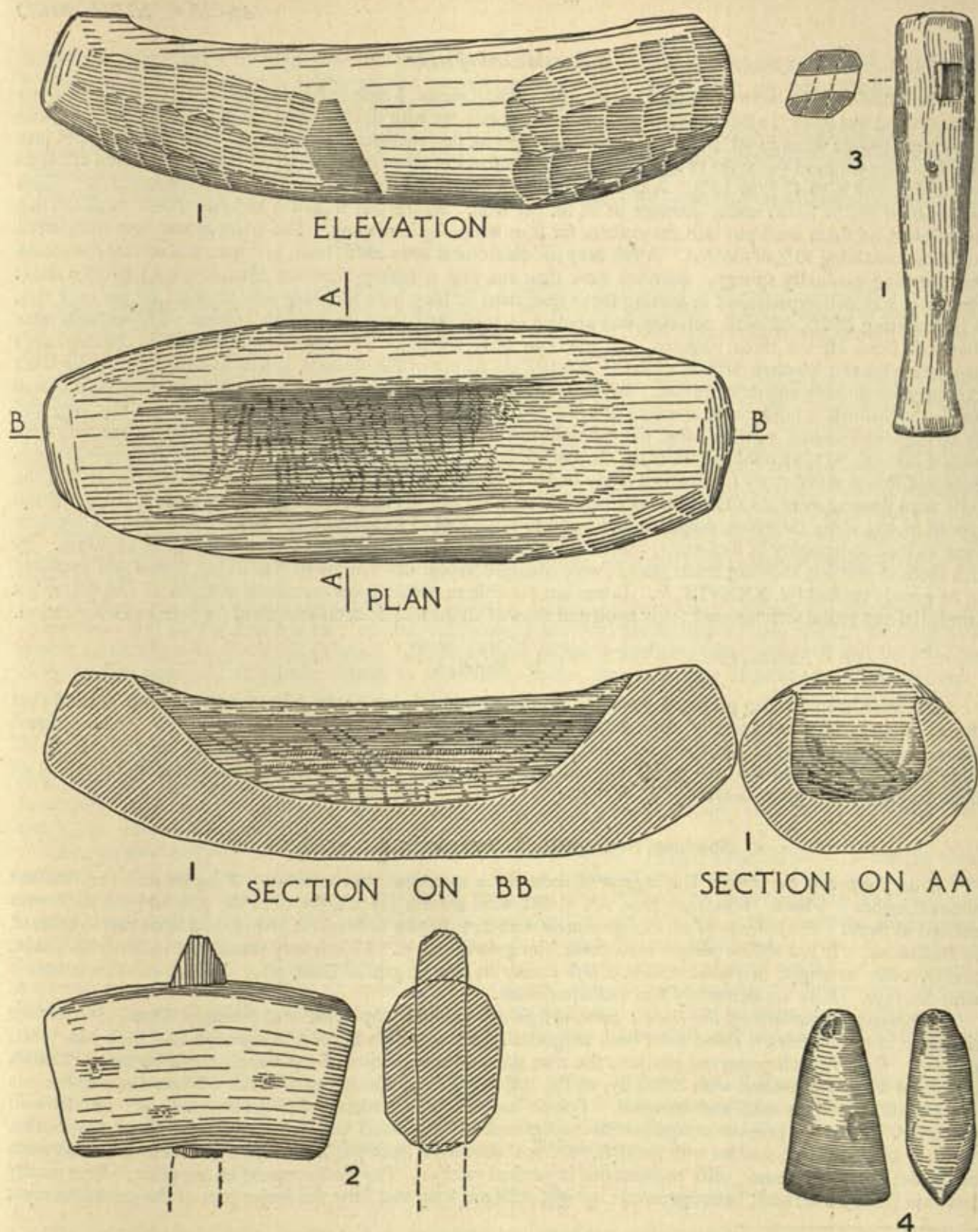


FIG. 44. 1-3, objects of wood; 4, stone axe.  $\frac{1}{2}$



## 2. Method of study

The wood samples were embedded in celloidin. Small pieces,  $\frac{1}{2}$  inch to  $\frac{3}{4}$  inch square, were cut with a sharp hacksaw and put in 70% alcohol overnight. Air was drawn out with the help of a vacuum-pump and the specimens were passed through 90% and absolute alcohol giving two changes in each daily. They were then put into alcohol-ether solution twice for twelve hours. The samples were then put through the celloidin solution of 2% to 4% to 6% to 8% to 12% to 16%. A pressure cylinder was used to expedite the process of embedding.<sup>1</sup> Each stage lasted for 24 hours under pressure of 80 lb. per inch. At the last stage the samples with a thick coating of celloidin on them were put into chloroform for four hours for hardening. The material was next transferred to tubes containing 30% of alcohol. A few drops of chloroform were added later, as it was noticed that the blocks were turning gradually spongy. Sections were then cut with a Jeffrey-Thomson Microtome, 15 to 30  $\mu$  thick. Difficulty was still experienced in cutting these specimens as they were breaking into pieces. To get over this, a thin coating of 2% celloidin solution was applied to keep the tissues intact while cutting. The sections were then cut from all the three surfaces, and put into 50% alcohol. They were then stained in Haidenhain's haematoxylin and Bismark brown. Due to the delicate nature of the sections, it was necessary to handle them carefully for staining and dehydrating. Before permanently mounting them in Canada Balsam, they were passed hurriedly through a mixture of absolute alcohol and ether to remove the celloidin. Sometimes this step had to be omitted because, on dissolving, the celloidin sections broke into pieces. To overcome this, sections were passed through 90% alcohol and absolute alcohol, adding a little chloroform in each. Even then, some sections were not found satisfactory for detailed study under microscope. In the case of AK II-535 and AK II-554, the cells were pressed so much that it was not possible to make out the diagnostic features of these timbers. Fresh sets of blocks were, therefore, prepared and put into hot KOH (5%) solution for about two hours. They were then washed thoroughly in hot water, passed through the alcohol series and finally embedded in celloidin. By this method sections showing better details were obtained except one sample of AK II-554, which still appeared to be greatly twisted (pl. XXXVIII, 5). It was not possible to obtain good transverse sections of this piece, but tangential and radial sections were fairly good and showed all the minute details required for definite identification.

## 3. Results

The microscopic slides prepared were first examined under lower-power microscope. It was noticed that the six samples of wood actually came from three different trees. Two pieces marked by the Archaeological Department as AK II-552 and the piece marked AK II-535 came from one tree, one piece marked AK II-552 from a second tree and the two pieces marked AK II-554 from a third tree. Detailed anatomical report on their examination is given below.

## Specimen Nos. AK II-552 (two pieces) and AK II-535

*Gross feature of the wood:* The biggest of these three specimens was 4 inches  $\times$  3 inches and the smallest about 2 inches  $\times$   $\frac{1}{2}$  inch. Specimen Nos. AK II-552 were from a branch, for both the pith and the bark were noticed in them. The colours of all the specimens were dirty brown to blackish brown, and some parts appeared to be charred. It is a *diffuse-porous* wood with faint growth marks. *Vessels* very small, just visible with a lens, scanty, often arranged in radial chains. *Soft tissues* in fine tangential lines, often forming net-like structure with the rays. *Rays* are extremely fine and equidistant.

*Microscopic structure of the wood:* *growth-rings* are delimited by thick and flattened fibres. *Vessels* are single or in radial pairs. These have been tangentially pressed often beyond recognition and look like radial grooves. Only in well-preserved portions the true size and distribution of the vessels could be seen. Pits on the vessel walls are noticed with difficulty, as the majority of the vessels are crushed. When distinct, the pits are minute, round to oval and crowded. Tylosis has not been noticed. *Parenchyma cells* are usually well preserved. They are prominent against the background of the wood and are abundant. Their distribution varies from diffuse to reticulum with the rays, to almost concentric lines (pl. XXXVIII, 2). These are mostly one cell wide; crystals in some cells conspicuous in vertical sections. *Pith flecks* present in one place. *Rays* mostly 1-seriate (rarely 2-seriate), heterogeneous; upright cells are long and form the major part of the uniseriate rays;

<sup>1</sup> K. A. Chowdhury, 'An improved method of softening hard wood-tissues in hydrofluoric acid under pressure,' *Ann. Bot.*, XLVIII, 1934.



horizontal cells small and difficult to be distinguished. *Fibres* individually unrecognizable, small, rather thick-walled and packed in groups in between the parenchyma bands and rays. They are non-septate. From the nature of the structure, it appears to be a fine-textured, hard and tough timber.

*Identification:* From the above it will be noticed that these ancient timbers in cross-section resemble *Excaecaria agallocha*, *Mallotus* spp., *Trewia nudiflora*, *Sapium* spp., *Diospyros* and *Maba* spp. But of these, only *Diospyros* and *Maba* spp. show the greatest affinity in all respects, e.g. fibres, parenchyma cells, vessels and rays. Moreover, the pits are also similar. The ancient timber specimens are, therefore, identified as *Diospyros* and *Maba* spp.

#### Specimen No. AK II-552 (one piece)

*Gross feature of the wood:* The specimen is about 3 inches  $\times$  2 inches in size and rather irregular in shape. Its colour is dark brown. *It is a diffuse-porous wood.* *Growth rings* indistinct. *Pores* hardly visible to the eye but distinct with a lens, small, in radial pairs of 2-5 (mostly 2-3). *Soft tissues* hardly to just visible with a lens, scattered in the fibrous tissues. *Rays* visible with a lens, fine and equidistant.

*Microscopic structure of the wood:* *growth rings* indistinct; there is, however, a suggestion of growth marks at places due to flattened fibres and scanty pores. *Vessels* small, mostly in radial pairs of 2-3, thick-walled; vessel perforation plate simple; pits on the walls small, numerous, round to oval and crowded; tyloses absent. *Tracheids* present close to the vessels, heavily pitted. *Parenchyma cells* distinct, well-preserved, wider than fibres, generally scattered, also form irregular reticulum with the rays (pl. XXXVIII, 1). *Fibres* non-septate, narrow but thick-walled, lumen almost closed, closely packed. *Fibres* are not always well preserved and often the thickening of the cell wall difficult to determine; inter-fibre pits scanty or not seen. *Rays* well preserved, closely spaced, 1-4 seriate (mostly 2) and heterogeneous; (a) uniseriate type consists entirely of upright or high cells, and (b) multiseriate type consists of both upright and horizontal cells, sometimes alternately arranged forming very deep rays (pl. XXXVIII, 3).

*Identification:* The arrangement of vessels indicates affinity to *Sapotaceae*, *Ebenaceae*, *Apocynaceae* and *Rubiaceae*. But in the dense nature of the wood, small and very thick-walled fibres and the heterogeneous rays, it resembles most closely *Sapotaceae*. All the timbers of this family have been compared and the structure of the ancient wood shows greatest affinity to *Mimusops*. It has, therefore, been identified as *Mimusops* spp.

#### Specimen No. AK II-554 (two pieces)

*Gross feature of the wood:* The specimens are fairly large (4 inches  $\times$  2 inches) and appear to be portions of a large tree. The colour of the wood is dark red. *Growth rings* indistinct. *It is a diffuse-porous wood.* *Pores* fairly large, visible to the eye, single or in radial pairs, uniformly distributed. *Soft tissues* indistinct to the eye. *Rays* only visible with a lens, fairly broad.

*Microscopic structure of the wood:* *growth rings* inconspicuous. *Vessels* medium-sized, round to oval, uniformly distributed; perforation plate simple; pits distinct, roundish and crowded. *Parenchyma cells* conspicuous by their uniform distribution and heavy deposits, often forming net-like structure with the rays; tangential band of parenchyma (2-3 cells) noticed in one place (pl. XXXVIII, 4). *Fibres* narrow, thick-walled, small lumened. In some portions fibre walls have been dissolved away, and cells have collapsed. *Rays* fine to broad, 1-8 cells wide, sometimes twisted, showing up prominently due to profuse reddish-brown deposits. *Rays* two types—the short type is of equal height and forms irregular ripple-marks, the other very deep and broad. *Ripple-marks* inconspicuous. *Gum canals* found in two places. In one place large canals are of irregular shape and occur in three adjacent rows. In another specimen they are small in size embedded in the tangential band of parenchyma.

*Identification:* This timber apparently belongs to the group *Malvales*, i.e. *Sterculiaceae*, *Tiliaceae* and *Malvaceae*. On comparison it shows most affinity with *Heritiera* having dense structure, parenchyma network with heavy deposits. *Rays* are of two types—high and low: the former forming the ripple-marks and the latter very deep and wide. The timber is, therefore, identified as *Heritiera* spp.

#### 4. Fruit shells

The pieces of fruit shells sent have been examined and identified as probably portions of cocoanut (*Cocos nucifera*) and palmyra (*Borassus flabellifer*).



## 5. General remarks

The wood specimens examined show that they represent portions of wood from three different trees, viz. *Diospyros* spp. (including *Maba* spp.), *Mimusops* spp. and *Heritiera* spp. All these trees at present produce well-known commercial timbers. *Diospyros* and *Maba*, the former containing some very important and large forest trees, occur chiefly in South India, Ceylon, Bengal, Burma and the Andaman Islands; only a few species extend to northern India. From a commercial point of view the wood is important and is commonly used for turnery and carving walking sticks, umbrella handles, inlay for furniture and fancy articles. Moreover, the well-known black ebony comes from one of the timbers belonging to this group. *Mimusops* are evergreen trees and are found on the east coast from the Kistna river southwards, in the Carnatic, in ravines and hills; on the west coast from Bombay to Travancore and also in Burma and the Andaman Islands. The timber is strong and durable and is commonly used for oil presses, tool handles, piles, ploughs, harrows, carts, boats, rice pounders and also for building and constructional purposes. *Heritiera*s are usually associated with tidal and delta forests of India and are well represented in the Sunderbans, Chittagong tidal forests, coast forests of Burma and the Andamans. In South India the distribution is rather local: they are found on the west coast of Cochin, Tinnevely, Travancore and perhaps also in the east coast in southern districts. The timber samples of *Heritiera* which we have examined appear to come from a fairly large tree. From this one is inclined to think that the wood may not have been locally obtained. This timber is extensively used for boat-building, agricultural implements, carts, constructional purposes, and fuel.

Our thanks are due to Messrs. K. N. Tandon and Damar Singh of the Wood Technology Section, Forest Research Institute, for their help.

## M. MISCELLANEA

The post-Arretine layers in the Northern Sector yielded a very large number of sawn conch-shells, possibly unfinished bangles, although no finished bangle was found. A few pieces are crescent-shaped and may have been used as ear-ornaments (pl. XXXIX).

A fragment of a bangle of amber-coloured glass, with lozenge-shaped impressions, alternately filled with dots and an oblique line, constitutes the only glass bangle found in 1945. It is from a superficial and unstratified deposit in the Southern Sector, and may post-date the urban occupation. In the Pondicherry Bibliothèque are fragments of two other glass bangles from the previous excavations (pl. XXXIIB, 8-9).

The following objects are of uncertain use:—

- (1) A flat ring of crystalline quartz (fig. 43, 6). Northern Sector, post-Arretine.
- (2) A long piece of ivory, elliptical in section, divided into zones with parallel incised lines (fig. 43, 7). Northern Sector, pre-Arretine.
- (3) Fragment of an ivory handle (?) of plano-convex section, divided into zones by raised bands, the sides containing at least two mortices, the intervening space decorated by rosettes (pl. XXXVIB). Found in the previous excavations, now in the Pondicherry Bibliothèque.

## N. COINS

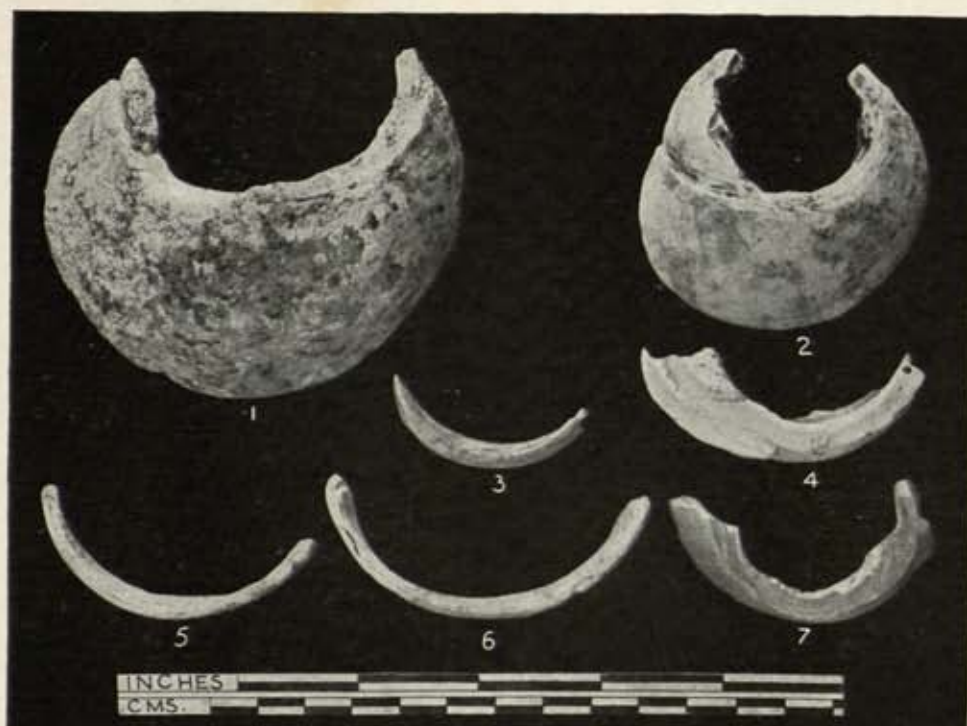
Two coins were found in late post-structural deposits in the Southern Sector (AK IV). One of them is corroded and without any details; the other one belongs to a well-known type of Rājārāja Coḷa (A.D. 985-1017).<sup>1</sup> A third coin, utterly defaced, was unstratified.

## O. PICTORIAL GRAFFITI ON POTSDHERDS (PL. XL)

The graffiti showing *svastika* pattern have already been noticed above (pp. 49, 52). Arikamedu has also yielded the following pictorial graffiti, all on sherds of pottery Type 1:—

<sup>1</sup> Cf. W. Elliot, *Coins of Southern India*, London, 1886, p. 133 and pl. iv, 166. The Superintendent, Government Museum, Madras, informs me that coins of this type are exceedingly common in the southern districts of the Madras Presidency.





*Unfinished shell bangles*





Pictorial graffiti on potsherds.  $\frac{1}{1}$



1. Standing human figure carved in intaglio. From the post-Arretine phase of the Northern Sector (middle or second half of first century A.D.).

2. Male figure standing facing with arms extended. The figure is draped in a loose garment (*dhoti*) and is apparently holding a bow. From an unstratified deposit of the Northern Sector.

3. Geometrical representation of a fish. From Pottery Group A (Early Phase) of the Southern Sector (mid first century A.D.).

#### P. INSCRIBED POTSDHERDS<sup>1</sup>

The present excavations yielded eighteen potsherds bearing graffiti. The opportunity is taken to publish also two graffiti found previously by the French excavators.

##### 1. Date

Their associations indicate clearly that these graffiti belong to the first and second centuries A.D.

##### 2. Language

All save two of the graffiti which are capable of reconstruction are in Tamil, and are amongst the earliest known examples of that language. Unfortunately their limitation to names and a few Tamil words robs them of value as a contribution to the study of linguistic development. So far as can be determined, their language is akin to that of some fifty short epigraphs found engraved on rocks at natural rock-shelters in South India, especially in the Districts of Madurā and Tinnevely.<sup>2</sup> The exact nature of the language of these inscriptions is still open to question, but they appear to be in Early Tamil (as distinguished from the Tamil found in the early Tamil literature, as well as modern Tamil), with a sprinkling of Prākṛit. They have been dated to the third and second centuries B.C. but on grounds which are largely theoretical, in contradistinction to the dating of the Arikamedu sherds which is objective and secure.

Dr. N. P. Chakravarti adds the following comment:—

‘At first sight the script found on the graffiti from Arikamedu appears to belong to the first or second century B.C. when compared with the script of other Brāhmī inscriptions, particularly those found in the north. On the other hand, the date of the pottery as indicated by its association with dated antiquities, is of the first century A.D. or near date. The reason for this discrepancy is not, however, far to seek. The script of the Arikamedu pottery and the early rock-shelters of the Madurā and Tinnevely Districts seems to be more akin to the ancient Drāviḍī script than the regular Brāhmī as found in the edicts of Aśoka and other early inscriptions. We also know that the Drāviḍī script must have separated from the main stock of Brāhmī much earlier than the time of Aśoka, at the latest in the fifth century B.C. (Bühler, “Indian Palaeography”, *Indian Antiquary*, XXXIII, appendix, p. 8) This is undoubtedly the reason why so many archaic forms are noticed in the few inscriptions so far known in the Drāviḍī script. The development of forms after separation could not be so fast in Drāviḍī as in the regular Brāhmī, which continued to be used throughout the whole of India. If we bear this point in mind it would not be unreasonable to assume that, though the script of the Arikamedu graffiti appears to be similar to the script of Brāhmī inscriptions of the first and second centuries B.C., it

<sup>1</sup> This section is based upon reports from Dr. B. C. Chhabra, the Government Epigraphist, Dr. N. P. Chakravarti, his predecessor in the office, Mr. K. V. Subrahmanya Aiyer, and Mr. N. Lakshminarayan Rao.

<sup>2</sup> H. Krishna Sastri in *Proceedings and Transactions of the All-India Oriental Conference*, 1920, pp. 327-48; K. V. Subrahmanya Aiyer, *ibid.*, 1924, pp. 275-300.



PALAEOGRAPHICAL CHART OF SELECT LETTERS FROM EARLY SOUTH INDIAN INSCRIPTIONS						
LETTERS	BHATTI- PROLU	ARITTA- PATTI	MADURA AND TINNEVELLY OTHER THAN ARJITPATTI	SITTANNA- VASAL	ARIKAMEDU	MAMAN- DUR
a initial	𑌕 𑌖	𑌕	𑌕 𑌖	𑌕	𑌕 𑌖	
ā medial	<sup>yā</sup> 𑌕 <sup>rā</sup> 𑌖 <sup>sā</sup> 𑌗	<sup>chā</sup> 𑌕 <sup>lā</sup> 𑌖	<sup>kā</sup> 𑌕 <sup>vā</sup> 𑌖	<sup>nā</sup> 𑌕 <sup>kā</sup> 𑌖	<sup>rā</sup> 𑌕 <sup>rā</sup> 𑌖 <sup>tā</sup> 𑌗	<sup>tā</sup> 𑌕
i initial		𑌕	𑌕	𑌕	𑌕	
i medial	<sup>di</sup> 𑌕 <sup>bi</sup> 𑌖	<sup>ri</sup> 𑌕	<sup>ri</sup> 𑌕	<sup>chi</sup> 𑌕	<sup>ti</sup> 𑌕 <sup>chi</sup> 𑌖 <sup>vi</sup> 𑌗	<sup>vi</sup> 𑌕
ī initial			𑌕		𑌕	
ī medial	<sup>shī</sup> 𑌕				<sup>pī</sup> 𑌕	
k	<sup>ka</sup> 𑌕	𑌕	𑌕	<sup>kā</sup> 𑌕	<sup>ka</sup> 𑌕 <sup>ke</sup> 𑌖	<sup>ku</sup> 𑌕
ñ		𑌕				
tū			𑌕	𑌕		
m	<sup>(CRYSTAL)</sup> 𑌕 𑌖 𑌗	𑌕	𑌕	𑌕 𑌖	𑌕 𑌖	<sup>mā</sup> 𑌕
y	<sup>(CRYSTAL)</sup> 𑌕 <sup>yā</sup> 𑌖	𑌕 𑌖	𑌕 𑌖 𑌗	𑌕	𑌕	<sup>yi</sup> 𑌕
r	<sup>ra</sup> 𑌕	𑌕	𑌕 𑌖	𑌕	𑌕	𑌕
l	<sup>(CRYSTAL)</sup> 𑌕 𑌖		𑌕 𑌖	𑌕	𑌕 𑌖	<sup>lā</sup> 𑌕
!	𑌕	<sup>lā</sup> 𑌕	𑌕 𑌖 <sup>li</sup> 𑌗	<sup>lā</sup> 𑌕	<sup>lā</sup> 𑌕	
!		𑌕	𑌕	𑌕	𑌕 𑌖 𑌗	
r			<sup>ru</sup> 𑌕 <sup>re</sup> 𑌖 <sup>rai</sup> 𑌗	<sup>rā</sup> 𑌕		
n		𑌕	𑌕 𑌖	𑌕	𑌕 𑌖	𑌕

FIG. 45



actually should be relegated to a later period. If this assumption is correct then the so-called discrepancy between the palaeographic and the archaeological evidence would seem to disappear.'

### 3. Palaeography (see table, fig. 45)

(i) Comparison with the Mamandur inscription (ascribed conjecturally to the third century B.C.) shows a general similarity in the characters.

In this inscription, *ma* is of the angular variety, but at Arikamedu it is a loop with a cross-bar, as in the Śittannavāśal and other cavern inscriptions. The letter *ra* is a mere straight line at Arikamedu and in the cavern inscriptions of Madurā and Tinnevely districts, but in the Mamandur record it is a slightly zigzag line. The other letters have practically the same shape in both.

(ii) The characters of the Arikamedu graffiti closely resemble the cavern inscriptions (pl. facing page 57 of the *Annual Report on South Indian Epigraphy* for 1912; pl. facing p. 86, *ibidem* for 1915; pl. facing p. 7, *ibidem* for 1918), with the following exception: the letter *la* has a more circular form in the cavern inscriptions, whilst at Arikamedu it has the almost modern open form. This is a point in favour of a later date for the Arikamedu graffiti.

(iii) The Arikamedu characters are closely comparable with those of the Bhaṭṭiprolu (Kistna District) Brāhmī inscriptions, which are conjecturally dated by Bühler to the 'time immediately after Aśoka or about 200 B.C.' (*Epigraphia Indica*, II, 329).

(iv) The Arikamedu inscriptions may further be compared with the Hāthibādā and Ghosunḍi inscriptions (*Epigraphia Indica*, XXII, 199ff., and XVI, 25ff.), attributed by Dr. D. R. Bhandarkar to 'the beginning of the first century B.C.' Slight differences are:—

In the Hāthibādā and Ghosunḍi inscriptions the arms of *a* on the left are a little round, while in the Arikamedu inscriptions they are angular.

In the former the cross-bar of *ka* is drawn above the centre of the vertical line, but in the latter it is at or a little below the centre.

In the former the bottom of *pa* is a little angular, while in the latter it is fully round.

In the former the letter *ma* has a more developed shape than in the latter.

The letter *va* has a flattened base in the former.

### 4. Transliteration (see figs. 46, 47; pl. XLI)

1. AK I-67 contains traces of six letters which are broken and cannot be definitely made out.

2. AK I-127. Reading is clearly *āṇ pīya makar*, meaning 'the dear son of . . . . . ṇ'.

3. AK IV-198. This is one of the two Prākṛit inscriptions. It reads *Yakhamitasa*, meaning 'of Yakhamita (Skt. Yakshamitra)'.

4. AK I-168. Two inscribed pieces, which do not dovetail into each other but may be portions of the same inscription. The smaller piece contains four letters from the beginning and reads *ātanka*, which cannot be interpreted. The third symbol, which also occurs at the end of the bigger piece, is read as *ga* by Dr. Chhabra, while Mr. Subrahmanya Aiyer takes it to be an earlier form of *ṇa*.

The bigger piece consists of nine symbols which may be read as *cha ṇa cha ṇa ṭe no ba tā* (or *tī*) *ga* but cannot be interpreted. Dr. Chhabra reads the fifth letter as *ṭa*, but in that case the horizontal stroke occurring on the top of this letter will be superfluous and has to be explained. This symbol as well as the last three letters of this fragment are all new to the southern Brāhmī script, and their exact phonetic value must await determination.

5. AK II-69. Mr. Aiyer reads as *Tavapiālar*, which appears to be a personal name.



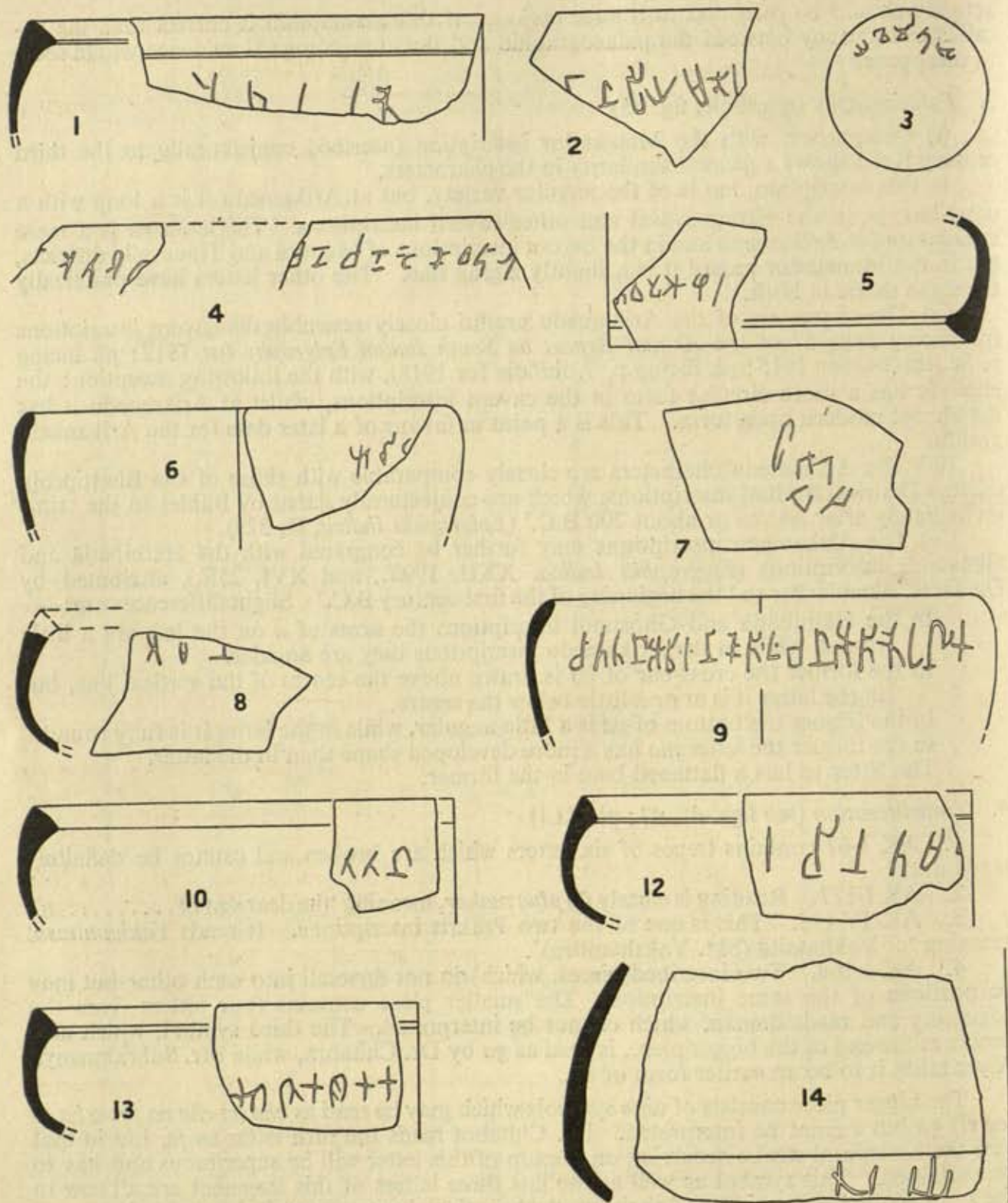
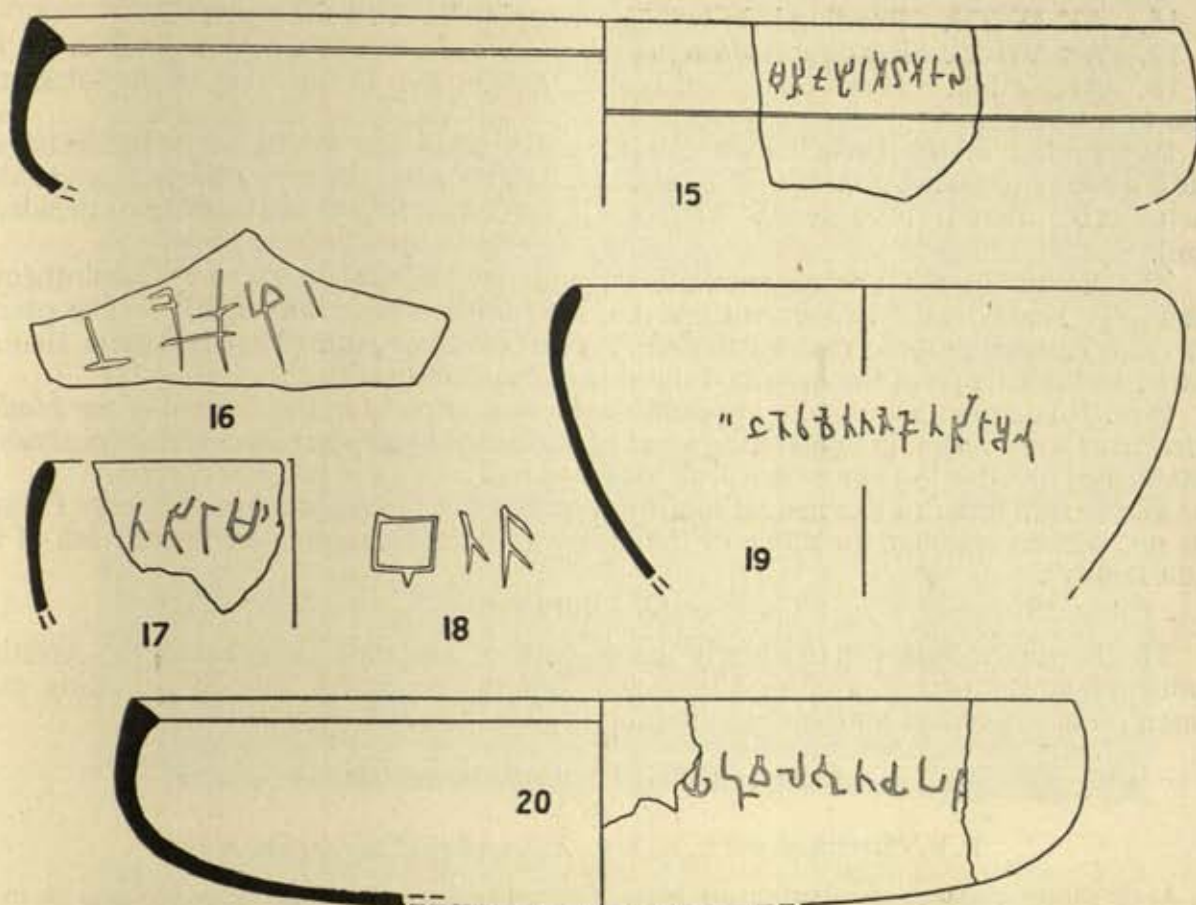


FIG. 46. Graffiti on pottery.  $\frac{1}{2}$



FIG. 47. Graffiti on pottery.  $\frac{1}{2}$ 

6. AK II-432. Mr. Aiyer reads these two letters as *āvi*, which indicates a personal name. The vowel *ā* here has a cursive form.
7. AK II-533 contains four symbols which appear to be only potter's marks.
8. AK II-562 reads *Āmaṇ*, which is a personal name.
9. AK II-571. Reading is *Chāṭṭaṇ Āvi iṇ koti Īchaṇ Āditaipaṇ*. The word *koti* seems to denote some relationship (Skt. *gotrin*?) which is preceded and followed by a proper name and may be translated as 'Īchaṇ Āditaipaṇ, a relation of Chāṭṭaṇ Āvi'. This record introduces a new form of *ī* and also shows a mark of punctuation at the end.
10. AK II-576. The extant portion reads *-ttaṇ* and indicates the end of a personal name.
11. AK III-67 contains remnants of three or four letters too fragmentary to be made out. Not illustrated.
12. AK III-89. Mr. Aiyer reads this as *ra chintam* and Dr. Chhabra as *ra chinabhama*. No sense can however be made of either reading.
13. AK IV-120. Reading is *ga ra ti ka śa ka ka*. Except the two *kas* the other letters are doubtful, but this inscription has its value as the final symbol showing *kka* would certainly suggest that the language is Tamil.
14. AK IV-194 contains two crude symbols which may be potter's marks.
15. AK IV-199. Reads *Mutikuḷuraṇ akal*, meaning 'the wide-mouthed pot of Mutikuḷuraṇ'.



16. AK IV-277. Reading is *-n kaikōlar*, meaning '..... n the weaver'.  
 17. AK VII-27. Reading is *-ittirāma* or *-ttiramī*, the end of a personal name.  
 18. AK V-117. Three letters reading *buttā*, i.e. the Tamil form of Buddhā, the name of a woman.

19. Found in the French excavations, and now in the Pondicherry Bibliothèque. Reading seems to be ..... *ntēva vaittatai kotti rālu* (?) and may mean 'having carved that which was bestowed by .... *ntēva*'. The sense is not certain though the language is decidedly Tamil.

20. Found in the French excavations, and now in the Pondicherry Bibliothèque. Reading is *Yadu(?) - valabhutaya pati* and the meaning seems to be: '(This is) the platter (*pātrī*) of Yaduvalabhuta (Yadubalabhūtā).' *Pātrī* (Skt.) or *pātti* (Pāli) means 'a shallow vessel', and the shape of the inscribed sherd is in conformity with this.

Prof. Nilakantha Sastri, who has published this inscription in the *Journal of the Madras University* (XIV, 3-4), takes *pati* in the sense of 'husband' or a contracted form of *patithāvita* ('established'). But the sense here suggested by Dr. Chhabra is perhaps correct.

The second letter in this inscription is not certain but the language is decidedly Prākṛit. It is not certain whether the name of the lady was 'Yadubalabhūtā' or 'Balabhūtā of the Yadu family'.

## Q. BONES

The Northern Sector, particularly the deposits of estuarine slime below the Arretine-producing strata (see above, p. 22), yielded a large number of bones, including three human ones. A report on their examination is given below.

### REPORT ON HUMAN AND ANIMAL REMAINS

By

B. K. CHATTERJEE and H. K. BOSE, *Anthropological Survey Laboratory*

As the gallery specimens and disarticulated bones of different animals of various ages preserved in the Indian Museum, Calcutta, were not available for comparison due to war conditions, a thorough examination of the bones submitted for report was not possible, and the work had to be restricted to the identification of individual bones with their respective Order and Species.

The degree of mineralization of the bones varies in the individual specimens. Thus, in specimens 13, 33, 34 the process of mineralization has gone to a considerable extent; in 8, 10, 11 and 12 it is appreciably less; whereas in the rest it has only commenced. The full extent of mineralization, however, can only be determined by a thorough chemical examination.

Apart from human relics, the animals identified include the following: (1) fowl, (2) turtle, (3) boar, and (4) cow, all edible animals; but it is difficult to determine the extent to which they were used as such. In some cases, however, there are marks of a sharp implement on the bone.

Most of the long bones such as femur, humerus and tibia, and other smaller bones such as metacarpal, metatarsal, phallange and calcaneum, were found intact; the reconstructed skull of a boar (No. 4 below) and a few others, together with all the human bones, were fragmentary.

### Classification of bones<sup>1</sup>

Class—Aves.

Order—Gallinae.

Genus—*Gallus ferrugineus*.<sup>2</sup>

1. Left femur of a fowl, complete.

<sup>1</sup> All the bones enumerated below were from the pre-Arretine layers of the Northern Sector, unless otherwise specified.

<sup>2</sup> W. T. Blanford, *The Fauna of British India, Birds* (1898), IV, 75.





Inscribed potsherds







Class—Reptilia.  
 Order—Chelonia.  
 Family—Trionychidae.  
 Genus—*Lissemys punctata* (Bonnaterre).<sup>1</sup>

2. Small fragment of the carapace of a turtle.

---

Class—Mammalia.  
 Order—Carnivora.  
 Family—Suidae.  
 Genus—*Sus cristatus*.<sup>2</sup>

3. Fragment of the right side of the mandible of a boar with two molars and one premolar. From a post-Arretine layer.  
 4. Mandible of a boar almost complete with two incisors, three premolars and three molars on the left side and one incisor and a portion of a canine and three molars on the right. From a post-Arretine layer.  
 5. Portion of the left side of the lower jaw with two molars. From an Arretine-producing layer.  
 6. Small fragment of the lower jaw with impressions of the roots of teeth. From a post-Arretine layer.  
 7. Portion of the right side of upper jaw with two molars and one premolar.

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Class—Mammalia.  
 Order—Ungulata.  
 Family—*Bos indicus linnaeus*.<sup>3</sup>

8. Complete right humerus.  
 9. Fragment of the distal end of humerus.  
 10. Complete humerus.  
 11. Complete humerus of a young individual.  
 12. Almost complete humerus of a young individual. From an Arretine-producing layer.  
 13. Almost complete left scapula after reconstruction. From an Arretine-producing layer.  
 14. Fragment of the head of a scapula. From a post-Arretine layer.  
 15. Fragment of a scapula of a very young individual. From an Arretine-producing layer.  
 16. Fragment of the proximal end of the third and fourth metacarpal.  
 17. Almost complete third and fourth metacarpal of a young individual. From a post-Arretine layer.  
 18. Portion of the third and fourth metacarpal of a young individual.  
 19. Almost complete right femur after reconstruction. From an Arretine-producing layer.  
 20. Almost complete left tibia.  
 21. Complete third and fourth metatarsal.  
 22. Almost complete third and fourth metatarsal of a young individual.  
 23. Second phallange of the hind leg.  
 24. Premolar tooth with broken roots.  
 25. Molar tooth, roots partially broken. From an Arretine-producing layer.  
 26. Almost complete incisor tooth. From a post-Arretine layer.  
 27. Incisor, roots broken.  
 28. Calcaneum of a very young individual.  
 29. Almost complete vertebrae of the hinder part of an adult individual. From an Arretine-producing layer.  
 30. Small fragment of a vertebra.  
 31. Fragment of a rib of an adult individual. From an Arretine-producing layer.  
 32. Fragment of a pelvis (?). Mark of a sharp implement present.

<sup>1</sup> G. A. Boulenger, *The Fauna of British India, Reptilia and Batrachia* (1890), p. 17; B. Prashad, 'Animal Remains from Harappā', *Memoirs of the Archaeological Survey of India*, No. 51 (Delhi, 1936), p. 14; R. B. S. Sewell and B. S. Guha in *Mohenjodaro and the Indus Civilization II* (London, 1931), p. 663.

<sup>2</sup> W. T. Blanford, *The Fauna of British India, Mammalia* (1888-91), I, 560.

<sup>3</sup> *Ibid.*, p. 483.



Class—Mammalia.  
 Order—Primates.  
 Sub-Order—Anthropoidae.  
 Family—Hominadae.<sup>1</sup>

33. Fragment of a left human mandible of an adult with two canines, four incisors, two molars and one molar with its cusps highly eroded. From an Arretine-producing layer.
34. Fragment of a left human mandible with two premolars and two molars of a young individual. From a post-Arretine layer.
35. Fragment of the shaft of a human fibula. Both ends broken. From an Arretine layer.

## 6. APPENDICES

### APPENDIX I

#### *Roman coins, first century B.C. to fourth century A.D., found in India and Ceylon*

Opportunity is taken to print a revised list of identified Roman coins found in India and Ceylon, and to add a map (fig. 48), on which Arikamedu is also indicated although no Roman coins have yet been found there. The map emphasizes afresh the remarkable extent of the contact of South India with the western world during the Roman principate, implying incidentally a full use of the south-western monsoon. It would appear that the Roman traders found the smaller South Indian kingdoms more amenable or accessible than the large and powerful Āndhra kingdom of the centre, although the latter, with its abundant mineral resources, may be supposed to have taken some part in the business, and indirect cultural contacts with the Mediterranean (notably in the form of clay or metal *bullae* based vaguely on Roman coinage) are discovered there from time to time.

A notable feature of the map is the great cluster of coins, particularly hoards, of the first century A.D. in the Coimbatore district of the South. This may be partially explained by the ancient beryl mines in the district (p. 123); but it is probably more significant that at this point the Eastern Ghats swing westwards and terminate upon the line of the Western Ghats, and that the valley of the Ponnani carries a natural trans-peninsular highway immediately south of the abutment. This highway must have provided a useful alternative to the long coastwise route between the Malābār and Coromandel ports, although the numerous coin-hoards suggest that it was not free from peril in the broken country of the divide.

#### COIN LIST<sup>2</sup>

##### *Bihar*

1. Bāmanghāṭī, Singbhum Dist. (between Chaibāsa and Balasore, on the main road running W. from the port of Tamruk on the Hughli). Hoard of gold coins, including Gordian (d. A.D. 244). A. Cunningham, *Archl. Survey Rep.*, XIII (1882), 72.

##### *Bombay Presidency*

2. Dharpul, Sholāpur Dist. 18 aurei, Commodus—Severus (d. A.D. 211). *Num. Chron.* 1st S., V (1843), 202; *Bombay Gazette*, Jan. 31, 1842; W. Elliot in *Madras Journ. of Lit. and Sc.*, XIII (1844), 215.

<sup>1</sup> W. T. Blanford, *The Fauna of British India, Mammalia*, I (1889–91), 3; Reynolds, *The Vertebrate Skeleton* (Sidney, 1913), p. 47.

<sup>2</sup> I gladly acknowledge help from Mr. T. G. Aravamuthan in the revision of this list.



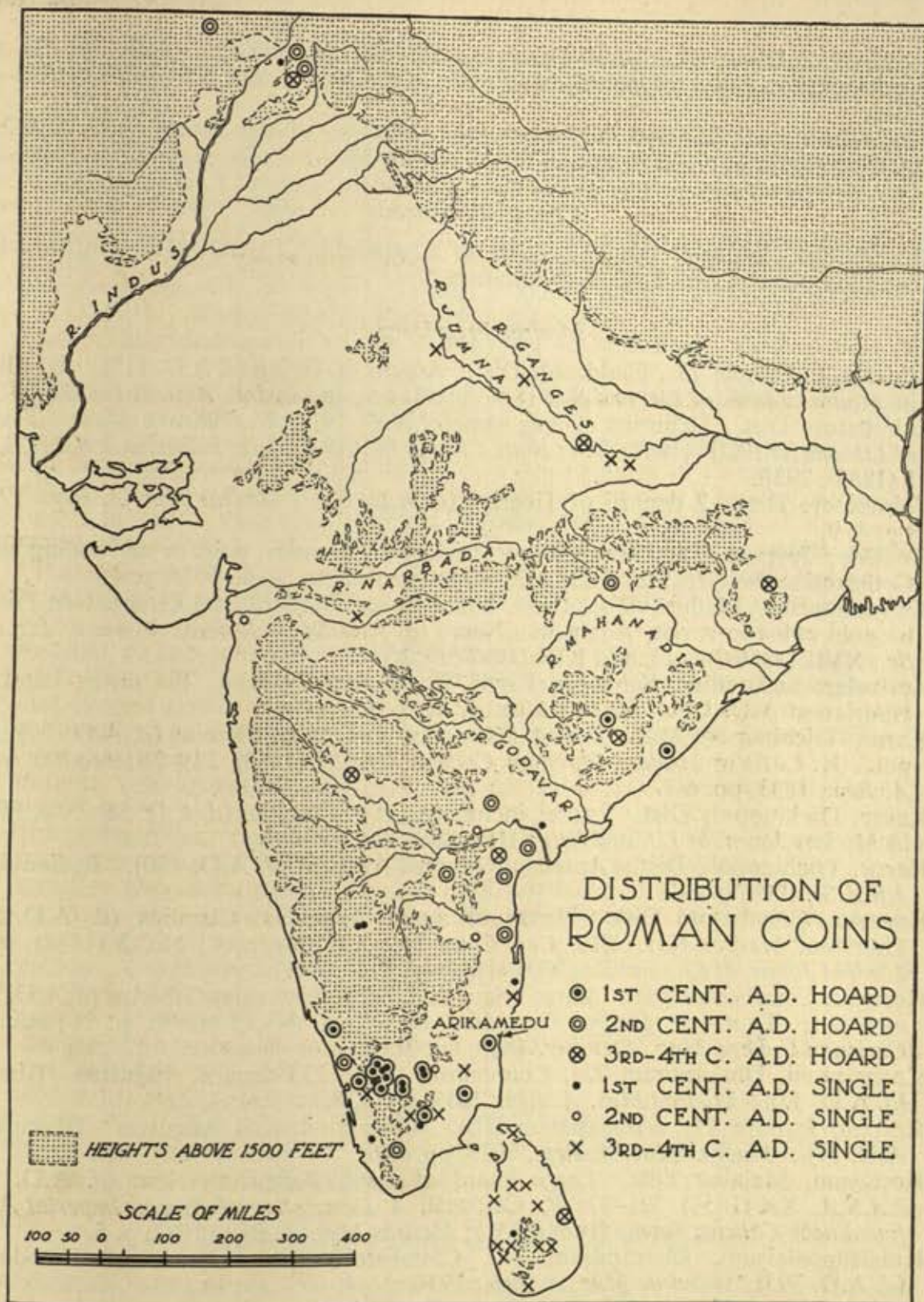


FIG. 48



3. Nagdhara, Jalālpur Tk., Surat Dist. Aureus of Lucius Verus (A.D. 166-7). O. Codrington in *Journ. of the Bombay Branch of the Roy. Asiatic Soc.*, XVIII (1890-4), 30-8.
4. Waghoda, Raver Tk., East Khandesh Dist. Aureus of the Severi (A.D. 202-20). O. Codrington in *J.B.B.R.A.S.*, XVIII (1890-4), 38.

*Central Provinces*

5. Chajerbedha, Bilāspur Dist. 2 aurei of Commodus (d. A.D. 192). Information supplied through Mr. T. G. Aravamuthan.

*Madras Presidency*

6. Athirāla, Pullampet Tk., Cuddapah Dist. Aureus of Trajan (d. A.D. 117). W. Elliot in *Madras Journ. of Lit. and Sc.*, 1844, pp. 214-5; and in *Ind. Ant.*, II (1873), 241-2.
7. Coimbatore Dist. Denarius of Augustus (d. A.D. 14). W. Elliot in *Madras Journ. of Lit. and Sc.*, XIII (1884), 214; *Num. Chron.*, I (1843-4), 162; J. Bird in *J.B.B.R.A.S.*, I (1883), 293ff.
8. Coimbatore Dist. 2 denarii of Tiberius (d. A.D. 37). *Madras Mus. A. Rep.*, 1912, pp. 4, 9.
9. Gumāda, Jeypore Tk., Vizagapatam Dist. 23 Roman gold coins, ending with Constantine the Great (d. A.D. 337). *Madras Mus. A. Rep.*, 1928, p. 4.
10. Kaliyamputtur, Madurā Dist. (near boundary of Madurā and Coimbatore Dist.). 63 gold coins in a pot, Augustus—Nerva (d. A.D. 98). *Madras Journ. of Lit. and Sc.*, XVII (1856-7), 114, and XIX (1857-58), 157-8.
11. Karivalamvandanallur, Sankaran Koyil Tk., Tinnevely Dist. Six aurei, latest of Hadrian of A.D. 118. *Madras Mus. A. Rep.*, 1933, p. 5.
12. Karur, Trichinopoly Dist. About 500 coins, Augustus—Tiberius (d. A.D. 37) in a pot. H. Little in *Madras Christian College Mag.*, I (1883), 219-26; *Madras Mus. A. Rep.*, 1893, pp. 6-7.
13. Karur, Trichinopoly Dist. 5 aurei, including one of Claudius (d. A.D. 54). W. Elliot in *Madras Journ. of Lit. and Sc.*, XIII (1884), 214.
14. Karur, Trichinopoly Dist. Aureus of Marcus Aurelius (d. A.D. 180). R. Sewell in *J.R.A.S.*, 1904, p. 617.
15. Karuvur, Coimbatore Dist. Hoard of aurei, Augustus—Claudius (d. A.D. 54). Thurston, *Madras Gov. Mus. Cat. Coins* No. 1 (1874), p. 1; No. 2 (1888), p. 8. *Madras Journ. of Lit. and Sc.*, XIII (1884), p. 214.
16. Karuvur, Coimbatore Dist. Large hoard of denarii, Augustus—Tiberius (d. A.D. 37), in a pot. Thurston, *Madras Gov. Mus. Cat. Coins* No. 2 (1888), p. 21; *Madras Christian College Mag.*, October, 1883, pp. 219ff.
17. Kattanganni, Dharapuram Tk., Coimbatore Dist. 233 denarii, Augustus—Tiberius (d. A.D. 37). *Madras Mus. A. Rep.*, 1913, pp. 4, 8.
18. Kotpad, Jeypore Tk., Vizagapatam Dist. 4 Roman denarii, Augustus—Tiberius (d. A.D. 37). *Madras Mus. A. Rep.*, 1915, pp. 5, 6.
19. Kottayam, Malabar Dist. Large hoard of aurei, Augustus—Nero (d. A.D. 68). *J.A.S.B.*, XX (1851), 371-87; R. Caldwell, *A Description of Roman Imperial Aurei found near Calicut*, Trivandrum (1851); *Madras Mus. A. Rep.*, 1882, p. 5.
20. Kulattuppalayam, Dharapuram Tk., Coimbatore Dist. Aureus of Theodosius (d. A.D. 395). *Madras Mus. A. Rep.*, 1934.
21. Madurā town. 11 Roman gold coins ending with Nero, dated A.D. 61-2. *Madras Mus. A. Rep.*, 1917, pp. 4, 5, 8.



22. Madurā town. Stray finds of copper coins, including Honorius and Arcadius (c. A.D. 400). R. Sewell, *List of the Antiquarian Remains in the Presidency of Madras*, I (1882), 291.
23. Madurā Dist. Aureus of Domitian (d. A.D. 96). *Madras Gov. Mus. Cat. Coins*, No. 2 (1894), p. 29.
24. Mahābalipuram, Chingleput Dist. Coin of Theodosius (d. A.D. 395). J. Prinsep in *J.A.S.B.*, I (1832), 406.
25. Mahābalipuram, Chingleput Dist. Coin possibly of Theodosius, late fourth century. *Arch. Sur. India, Southern Circle, A. Rep.*, 1888, pp. 2-4, 5.
26. Mallayapalem, Guntur Dist. 4 Roman aurei, ending with Antoninus Pius (d. A.D. 161). *Madras Mus. A. Rep.*, 1915, pp. 4, 5, 6.
27. Mambalam, Madras city. Coin of Augustus (d. A.D. 14). *Madras Mus. A. Rep.*, 1930, p. 6, and 1931, p. 2.
28. Nāgārjunikōṇḍa, Palnad Tk., Kistna Dist. Gold coin of Hadrian (d. A.D. 138). *Arch. Sur. India A. Rep.*, 1936-7, p. 61.
29. Nandyal, Kurnool Dist. Upwards of 52 gold coins, ending with Antoninus Pius (d. A.D. 161), in a pot. *Madras Mus. A. Rep.*, 1935, p. 5.
30. Nellor. Hoard of Roman coins in a pot, latest recorded a coin of Antoninus Pius (d. A.D. 161). Davidson in *Asiatic Researches*, II (1790), 331-2.
31. Ongole Tk., Guntur Dist. Hoard of coins of which two gold solidi of Nero and Hadrian (d. A.D. 138) are recorded. *Madras Mus. A. Rep.*, 1905, pp. 5 and 8.
32. Pennar, Coimbatore Dist. Denarius of Augustus. W. Elliot in *Madras Journ. of Lit. and Sc.*, XIX (1888), 228.
33. Pollachi, Coimbatore Dist. Hoard of denarii in a pot, said to be Augustus—Tiberius (d. A.D. 37). *Indian Antiquary*, IV (1875), 302; F. Buchanan, *A Journey from Madras*, II (1807), 318-9.
34. Salihundam, Chicacole Tk., Vizagapatam Dist. 11 denarii of Tiberius (d. A.D. 37). *Madras Mus. A. Rep.*, 1899, pp. 5, 9.
35. Tanjore. Silver-washed coin of Diocletian (d. A.D. 305). *Madras Mus. A. Rep.*, 1937, p. 7.
36. Tondamanathan, Cuddalore Tk., South Arcot District. 6 Roman gold coins, Tiberius—Nero (d. A.D. 68). *Madras Mus. A. Rep.*, 1918, pp. 3, 7.
37. Vellalur, Coimbatore Dist. 'A find of silver denarii', *Madras Mus. A. Rep.*, 1891, p. 8; E. Thurston in *Num. Chron.*, 1891, pp. 199-202; *Madras Mus. Catalogue of Coins* No. 2 (1894), p. 24.
38. Vellalur, Coimbatore Dist. 121 denarii of Augustus (d. A.D. 14). *Madras Mus. A. Rep.*, 1932, pp. 8, 9.
39. Vellalur, Coimbatore Dist. 522 denarii, Augustus—Claudius (d. A.D. 54) in a pot. W. Elliot in *Madras Journ. of Lit. and Sc.*, XIII (1844), 212-4; J. Bird in *J.B.B.R.A.S.*, I (1843), 294.
40. Vidiyadurrapuram, Bezwada Tk., Kistna Dist. Denarius of Tiberius (d. A.D. 37). *Arch. Sur. of India, Southern Circle, A. Rep.*, 1888, pp. 2-4, 5.
41. Vinukonda, Guntur Dist. 15 Roman gold coins, ending with Caracalla (d. A.D. 217). *Num. Chron.* 3rd S., IX (1889), 325-8.

*Punjab, N.-W. Frontier Province and Afghanistan*

42. Jalālābād, Afghanistan. In the Ahin Posh stūpa, with Kushan coins, were 3 Roman aurei, the latest of Antoninus Pius (d. A.D. 161). Waterhouse in *Pr. of the Asiatic Soc. of Bengal* (1879), pp. 77-9; A. F. R. Hoernle, *Ib.*, pp. 122, 134-5.



43. Manikyālā, Rawalpindi Dist., Punjab. 5 aurei, latest of A.D. 158-9. A. F. R. Hoernle in *Pr. A.S.B.*, LIII (1886), 86-9.
44. Manikyālā, Rawalpindi Dist., Punjab. 7 worn Republican denarii of the first century B.C., with Kushan coins of first-second century A.D. A. Court in *Journ. of the Asiatic Soc. of Bengal*, III (1834), 558-9; J. Prinsep, *Ib.*, 564-5; A. Cunningham, *Ib.*, 635-7.
45. Pakli, Hazara Dist., N.-W. Frontier. Hoard of denarii, the latest known being one of Hadrian (d. A.D. 137). *Num. Chron.* 3rd S., XIX (1889), 263.
46. Taxila, Rawalpindi Dist., Punjab. Denarius of Tiberius (d. A.D. 37). *Arch. Sur. India A. Rep.*, 1935, pp. 29-30, 83.

#### United Provinces

47. Allahabad. Coins of Diocletian (A.D. 283-93). J. Prinsep in *J.A.S.B.*, I (1832), 476.
48. Chunār, Mirzāpur Dist. Copper coin of Numerianus (A.D. 283). J. Prinsep in *J.A.S.B.*, I (1832), 392-408, 476.
49. Kanauj, Kanauj Tk., Farrukhābād Dist. Copper coin of Diocletian (A.D. 283-93). H. H. Wilson in *Asiatic Researches*, XVII, 561; J. Prinsep in *J.A.S.B.*, I (1832), 476.
50. Mathurā (Muttra). Gold coin of Caracalla (d. A.D. 217). Information from Curator of Curzon Museum, Mathurā.
51. Mirzāpur. Coin of Carinus, minted A.D. 283-4. *J.A.S.B.*, I (1832), 392-408, 476.

#### Cochin State

52. Eyyal, 22 miles N.-W. of Trichur. Found on the slope of a hill east of the village in an earthenware pot, 1945. 12 gold coins : of Trajan (Cos II), 1; Nero, 2; Claudius, 1; Tiberius, 8. About 50 silver coins, late Republican—Augustus. Also about 12 silver punch-marked coins, with some unstamped pieces of silver. Date of deposit, c. 100 A.D.; the Roman silver and the punch-marked coins are much worn, whereas the aurei are fresh. Information and photographs from the State Archaeologist, Cochin State.

#### Hyderabad State

53. Gaiparti, Suriapet Tk., Nalgonda Dist. 3 Roman gold coins, latest of Antoninus Pius and dated A.D. 140-4. *A. Report of Arch. Surv. of the Nizam's Dominions*, 1933, pp. 7, 39.

#### Mysore State

54. Chandravalli, Chitaldrug Tk. Denarius of Augustus (d. A.D. 23). *Arch. Surv. Mysore A. Rep.*, 1909, p. 30.
55. Chandravalli, Chitaldrug Tk. At least two denarii of Tiberius were found here in 'Excavation 15' in 1929 and are now in the Mysore Museum. They have not been published, but there is apparently a reference to one of them in *Excavation at Chandravalli, Supplement to the Annual Report of the Mysore Archaeological Department*, 1929 (pub. 1931), p. 25.
56. Yaswantpur, Bangalore Dist. 163 denarii, Augustus—Claudius (d. A.D. 54), in a pot. L. Rice, *Find of Roman Coins near Bangalore* (1891); and E. Thurston, *Madras Govt. Mus. Cat. Coins No. 2* (1894), pp. 26-8.



*Pudukkottai State*

57. Karukkakkuriochi, Alangudi Tk. Hoard of aurei, ending with Vespasian (*d. A.D. 79*). G. F. Hill in *Num. Chron.*, III, XVIII (1898), 304-20; G. G. Rodgers, *Ib.*, III, XIX. (1899), 263-5.

*Travancore State*

58. Poonjar, about 150 miles north of Trivandrum. Gold coin of Augustus, found 1945. Early first century A.D.

*Ceylon*<sup>1</sup>

59. Ampitiya. Coin of Arcadius (*d. A.D. 408*).  
 60. Anurādhapura. Coins of Theodosius, Arcadius and Indo-Roman coins in various places.  
 61. Attikuli, in Mannar Dist. Constantius, Theodosius and Arcadius.  
 62. Badulla. Coins of Aurelian and Arcadius.  
 63. Balapittya. Hoard of fourth century coins down to Arcadius.  
 64. Batticaloa. 5 coins of Arcadius and Honorius (*d. A.D. 423*).  
 65. Boragoda. 40 coins, Constantius II—Honorius.  
 66. Colombo. Many coins, Constantine II—Honorius.  
 67. Gintota. 6 of Constantine II, Arcadius and Honorius.  
 68. Hikkaduwa. 17 coins, Constantius II—Arcadius.  
 69. Kalmunai, Eastern Provinces. Arcadius or Honorius.  
 70. Kalpitiya. Coin of Honorius.  
 71. Kantarodni, in Jaffna peninsula. 150 fourth century bronze down to Honorius.  
 72. Kitalagama. Coins of Theodosius and Arcadius.  
 73. Kolugala, in Turpana. 220 coins, Constantine I—Honorius.  
 74. Kurunegala Dist. Coins of Nero and Vespasian.  
 75. Mantota. Antonine coins.  
 76. Matara. Coin of Maximian II.  
 77. Pandirippu, Eastern Province. 1 fourth century coin.  
 78. Pidarikulam, Giant's Tank. Coins of Gratian and Valentinian II or Theodosius I.  
 79. Sigiriya. 1,675 fourth century coins down to Honorius.  
 80. Udappu. Coins of Theodosius and Arcadius or Honorius.

## APPENDIX II

*Semi-precious stones*<sup>2</sup>

(Map, fig. 49)

Of precious stones, diamonds, rubies and sapphires were obtained in India for the Roman market: the first presumably from the Cuddapah and Kurnool system of the Deccan and the Vindhyan system of the centre; rubies probably from Ceylon, Salem and Mysore in southern India, and possibly Rewa in central India; sapphires also from Ceylon, Salem and the upper Godāvari. More extensive was the trade in Indian pearls, fished chiefly in the Palk Strait and the Gulf of Mannār, between Ceylon and the mainland, where the port of Kolkhoi served as a primary depot.

<sup>1</sup> See H. W. Codrington, *Ceylon Coins and Currency* (Colombo Museum, 1924); and J. Still in the *Journ. of the Royal Asiatic Soc.* (Ceylon Branch), XIX (1907).

<sup>2</sup> Information from the Geological Survey of India, and from J. Coggin Brown, *India's Mineral Wealth* (Oxford, 1936), pp. 283ff.



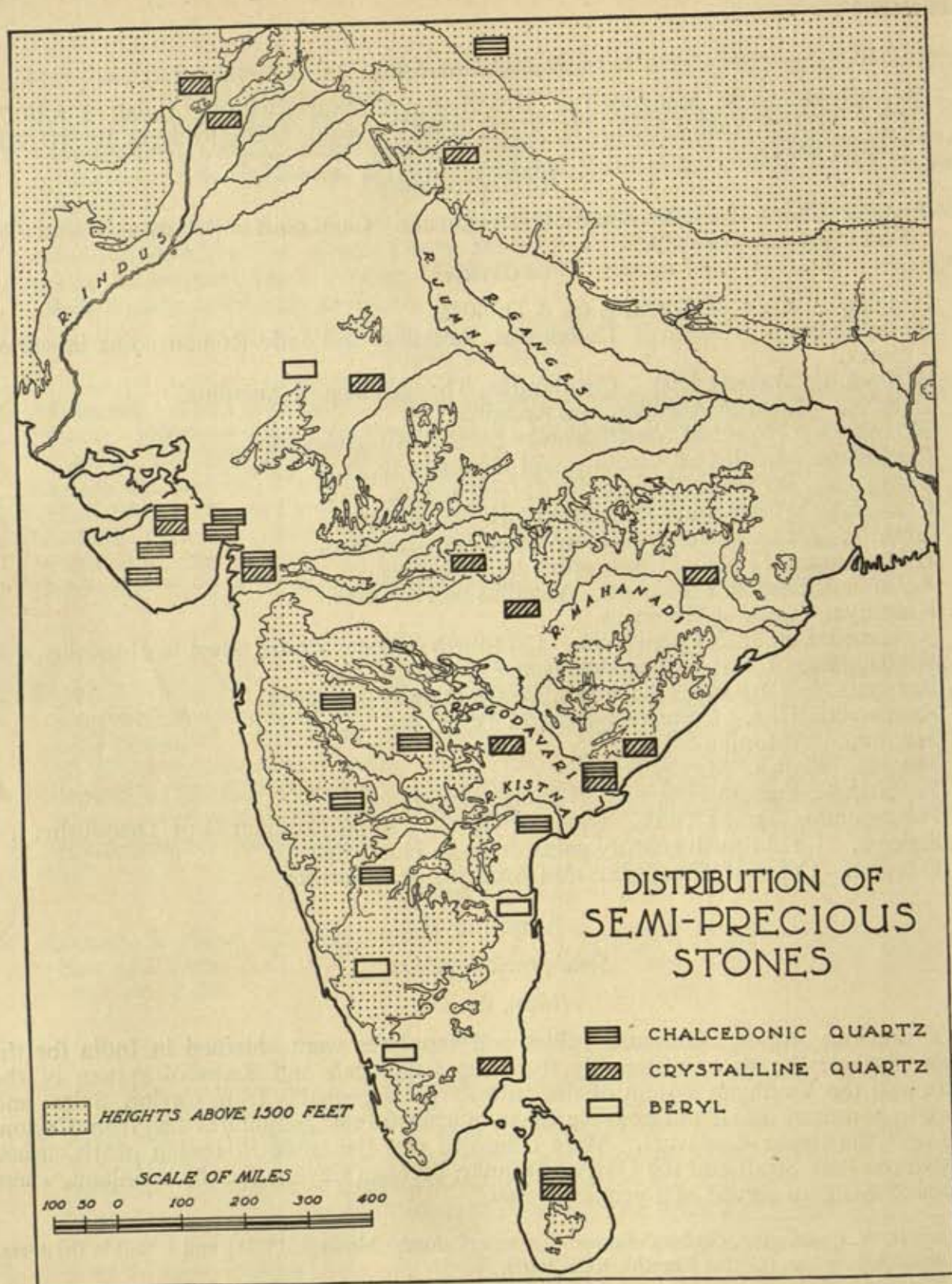


FIG. 49



At Arikamedu these precious materials have not yet been recorded. There, apart from glass and clay, the substances most extensively used for the manufacture of beads are chalcedonic and crystalline quartz. Beryl, though mined anciently and within easy reach, has not actually been identified at Arikamedu, but the omission may be accidental. The quartzes occur in a number of sub-varieties, of which agate, carnelian, onyx, jasper, rock-crystal and amethyst are the commonest. They are of widespread occurrence in India but, save for a prolific area in Gujarāt, tend to concentrate on the eastern slopes and foot-hills of the great central massif, and may thus have been a factor in the extension of Roman trade up the east coast. The principal source of beryl was at Padyur in the Coimbatore District, which lies conveniently near the divide between the eastern and western coasts. Indeed the valley of the Cauvery or Kāverī river, listed by Ptolemy as the Khabēros, links it directly with his 'Khāberis emporion', identifiable with Kāverīpattinam or Puhār, at the mouth of the river some 60 miles south of Arikamedu. It is probably significant that more early Roman Imperial coins have been found in the Coimbatore District than in any other part of India (see p. 116).

The main sources of these semi-precious stones are as follows:—

### 1. *Chalcedonic quartz*

Agate, carnelian, onyx and jasper occur largely in the amygdaloidal lava flows of the Deccan and Rājmahāl Trap. The most important centres are in Gujarāt, but the stones occur also in Kāthiāwār, Kashmīr, Bihār, and near Guntūr in the Madras Presidency. The principal sites are:—

Cambay and Ahmedābād.

Rājpiplā State.

Kāthiāwār (Tānkāra, Morvī State, Khokhri, Latipur, Badampur, Khakra).

Kashmīr (Kyamgo Traggar).

Hyderabad State (freely in the Deccan Trap).

Madras Presidency (alluvium of Kistna river near Guntur; and in the Godāvarī near Rājāhmundry).

Sunder State (Jaipur near Timappaghur).

Ceylon.

### 2. *Crystalline quartz*

Rock-crystal, cairngorm, cat's eye and amethyst occur notably as follows:—

Punjab (Aurangpur, Miānwali, Kālābāgh and Bashahar).

Kāthiāwār (Tānkāra, Morvī State).

Jaipur State (Nawai).

Tonk State (Hathuna).

Rājpiplā State.

Orissa (Sambalpur).

Central Provinces (Chindwara, Khairi).

Hyderabad State (Warangel).

Madras Presidency (Godāvarī near Rājāhmundry, Vizagapatam, Tanjore, Sandamandapuram).

Ceylon.

3. *Beryl*, which, with its bluish-green variety, aquamarine, may be ranked above the quartzes as a gem-stone, was, as mentioned above, long mined near Coimbatore in the Madras Presidency. It occurs also elsewhere, notably in mica-bearing pegmatites at



Govindsagar, Kishangarh State, in Rājputāna, near Nellor (Madras Presidency), and near Melkot (Mysore State).

### APPENDIX III

#### *The ancient name of Arikamedu*

The *Periplus of the Erythraean Sea*, after referring to Kolchhis or Korkai, the ancient pearl-port near the southern end of India, mentions the three principal markets and anchorages to which resorted the merchants of 'Limurikē', probably the region otherwise known as 'Damirika' (the Peutinger Table) and 'Dimiricā' (the Ravenna Geographer) and etymologically equivalent to the Tamil-land. The three ports, 'in the order in which we have named them' (from the context, south to north), are *Kamara*, *Podoukē*, and *Sōpatma*. Ptolemy (VII, 1, s. 14), after referring to 'the mouth of the river Khabēros', clearly the Kāverī, and *Khabēris emporion*, which may safely be identified with Kāverīpaṭṇam or Kāverīppaṭṇam, the modern Tranquebar, familiar in Tamil literature as a port frequented by foreign merchants (see above, p. 19), mentions *Sabouras emporion* (unidentified) and *Pōdoukē emporion*. He also is working northwards, so that *Pōdoukē* must be somewhere to the north of Kāverīpaṭṇam. Whether, as Müller suggested, Ptolemy's *Khabēris* should be equated with the *Kamara* of the *Periplus* is less certain; but the *Sōpatma* of the *Periplus* has with some plausibility been identified with the Sō-paṭṇam of Tamil literature, the modern Markāṇam, on the coast between Pondicherry and Madras.<sup>1</sup>

All that can be inferred from this is that the geographical position of Arikamedu (Pondicherry) is consistent with the general indications given for Podoukē or Pōdoukē by the *Periplus* and Ptolemy. The site lies 60 miles north of Tranquebar and 20 miles south of Markāṇam. Moreover, Pondicherry is a European corruption of *Pudu-chchēri*,<sup>2</sup> meaning 'Newtown', and it can at least be claimed that the Greek *Podoukē* is as near to this as is the modern French *Pondichéry*.

There the evidence at present ends. But the new identification of a Roman emporium in the immediate vicinity of Pondicherry gives a fresh and perhaps conclusive weight to the equation of Podoukē with Pondicherry which has already been suggested by more than one writer.<sup>3</sup>

<sup>1</sup> K. A. Nilakanta Sastri, *The Cōlas* (University of Madras, 1935), I, 30.

<sup>2</sup> *Hobson-Jobson* cites an English reference to the place in 1680 with the spelling 'Puddicherry'.

<sup>3</sup> See W. H. Schoff, *The Periplus of the Erythraean Sea* (London, etc., 1912), p. 242.